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THE IRON AGE

A Review of the Hardware, Iron, Machinery and Metal Trades.

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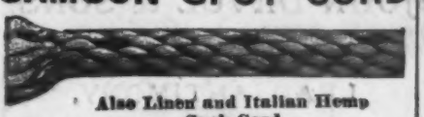
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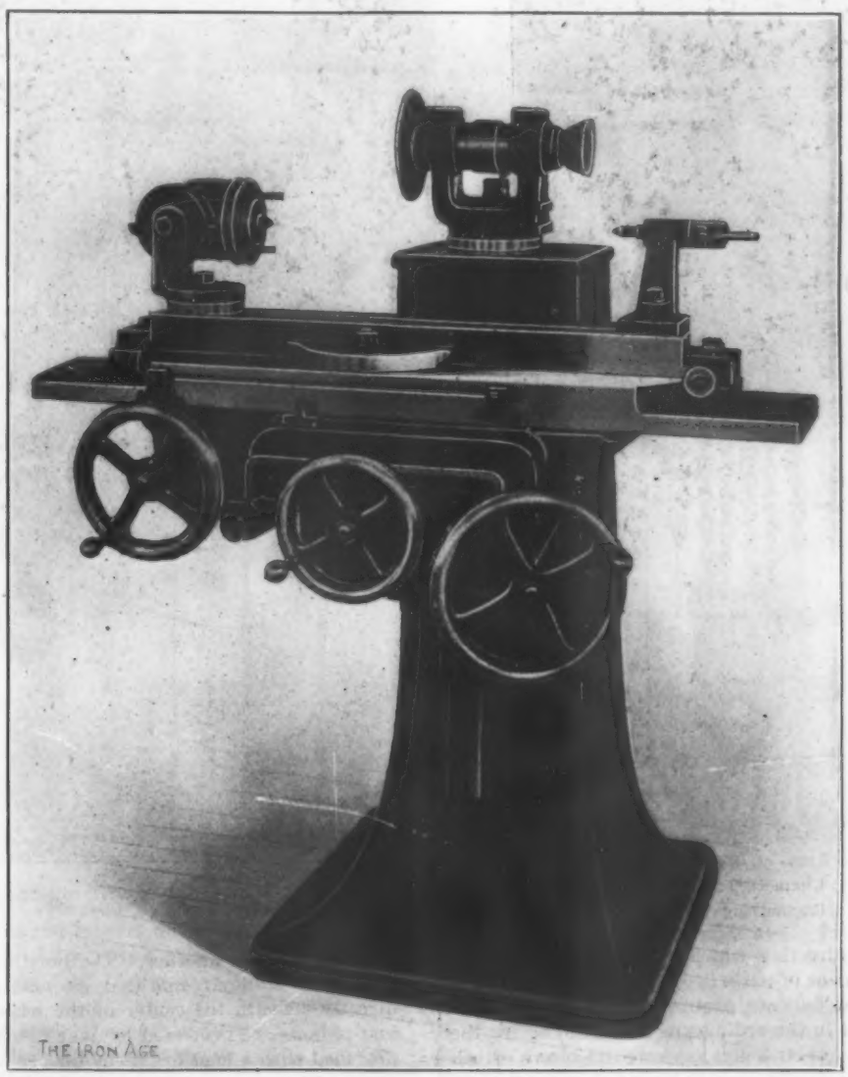
THE IRON AGE

THURSDAY, OCTOBER 27, 1904.

The Osterlein Universal Cutter and Tool Grinder.

The accompanying illustration shows a newly designed universal cutter and tool grinder for very accurate work brought out by the Osterlein Machine Company, Cincinnati, Ohio. As a grinder must be absolutely rigid and free from vibration if it is to do accurate work, special attention has been given to attaining this end. The column, as well as knee, saddle, slide and table, is of box form, with internal braces, and is well proportioned in shape and weight. The wheel spindle frame can be swiveled 180 degrees; the base is graduated, and may be locked in any position. It is made as dust proof as possible and can be adjusted to compensate for wear. All bearings, slides and screws are covered. The adjusting hand wheels are of large size, and are graduated on the outside reading to thousandths. The table is swiveled on a central stud and may be clamped in any position. It has a graduated arc in front, reading in degrees, and a scale imbedded in the slide reading tapers up to 3 inches per foot either way. One end of the table is cut as a segmental worm wheel, and by means of a worm can be readily adjusted either way to the desired taper.

For all operations there is but one tooth rest used. It has a micrometer adjustment and can be set in any position. The table has a longitudinal movement of 15 inches, a cross movement of 8 inches, and a vertical movement of 7 inches. The normal swing between centers is 9 inches, which may be increased by using raising blocks 12 inches high. The machine will grind 16-inch face mills or 36-inch saws. Many operations may be done on the grinder for which other grinders require special attachments, such as grinding gear cutters, face of teeth in taps, formed cutters, hobs, &c. The grinder complete is furnished with an internal grinding attachment, a 3-inch chuck, a swivel vise, a main and drum countershaft, and a set of grinding wheels.



The Osterlein Universal Cutter and Tool Grinder.

The Sterling Emery Wheel & Mfg. Company, Tiffin, Ohio, has decided to carry a complete line of its productions at Chicago, Ill., where it has secured the premises 65 Canal street, which is now being put in shape for the purpose, and which will be under the management of Messrs. Wilson and Webb, two gentlemen well and favorably known to the trade. The new branch gives the Sterling Company direct representation at New York, Chicago and San Francisco.

Three New Electric Hoists.

Electric hoists have advantages over hand operated hoists where their use is so frequent that speed of operation is an important factor in the economy of time. It is evident that this is becoming more and more appreciated by the users of this class of machinery from the attention which has very lately been given to their development by their manufacturers. Three different forms have recently been brought out by as many firms and are shown in the accompanying illustrations.

Fig. 1 shows a new electric chain hoist made by the Northern Engineering Works, Detroit, Mich. It is designed for comparatively light work where the traveling of the hoist is operated with sufficient ease to require no motor or gearing, but may be effected simply by pulling the load in the direction which it is desired to move it.

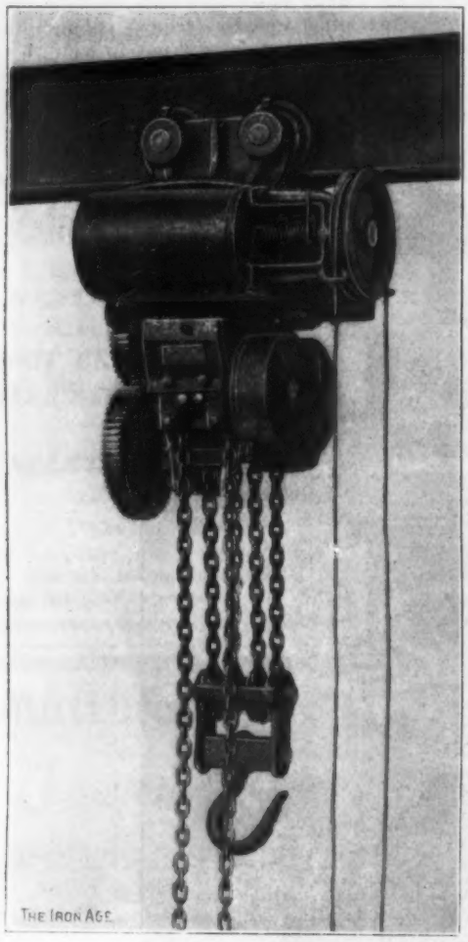


Fig. 1.—Electric Chain Hoist Built by the Northern Engineering Works.

The arrangement of parts is compact and commendable in that the most delicate parts are placed in protected locations, so that in the ordinary course of handling there is little danger of their being subjected to blows or other injurious influences. The motor is placed above the hoisting drum and drives the latter through a train of spur gearing. It is of the inclosed pattern, making it as nearly as possible dust proof. The controller is mounted on one side of the motor, as may be seen in the engraving. It is of the standard crane drum type construction and regulates the speed for any load. In the illustration the controller is shown operated by means of pendant cords, but it may also be furnished with a lever. All of the gearing is machine cut, no bevel or worm gears are used, and the highest efficiency is thus insured, as well as long wearing qualities.

The hoist can be attached to any type of trolley running on either single or double I-beam track, and may be adapted to a direct current supply of any standard voltage, from 110 to 550. This hoist is made in several sizes, from ½ to 5 tons capacity. It can be built into a trolley when desired, and can be readily attached to cranes. It is especially suitable for foundries, machine shops, power plants and warehouses. The Northern Engineering Works also manufactures a complete line of overhead tracks and switches, turntables, &c., to be used in connection with these hoists.

Figs. 2 and 3 illustrate a convenient high speed I-beam trolley hoist built by Pawling & Harnischfeger, Milwaukee, Wis., in which both the trolley travel and the hoist are operated electrically and controlled by a single lever. The hoist is of 1-ton capacity and runs on the lower flange of an I-beam, two of its four wheels—one on either side—being geared for the trolley drive. The truck bracket and the trolley frame are of one casting, affording great rigidity. The hoist motor and trolley drive motor are attached on opposite sides of the frame, so that they balance one another. The hoisting drum is so hung within the trolley frame that the load on the hook comes directly beneath the center of the wheel base. All gears and pinions are protected by gear cases. The machine is provided with a load brake, motor brake and limit switch. In the line drawing Fig. 3 A is the motor which gives the trolley travel through the train of gearing *a b c* and *d*, and B is the hoisting motor which connects with the drum through gears *e*, *f*, *g* and *h*. One of the contact wires for the motors is shown under the upper flange of the I-beam in the side view, and C is the trolley wheel. The other contact is made on the opposite side of the I-beam in a similar manner as shown in the end view at D. The motors are series wound and have four fields with armatures of the tunnel groove type. To protect against dust the motors are of the inclosed type. A direct current potential of 220 volts is used.

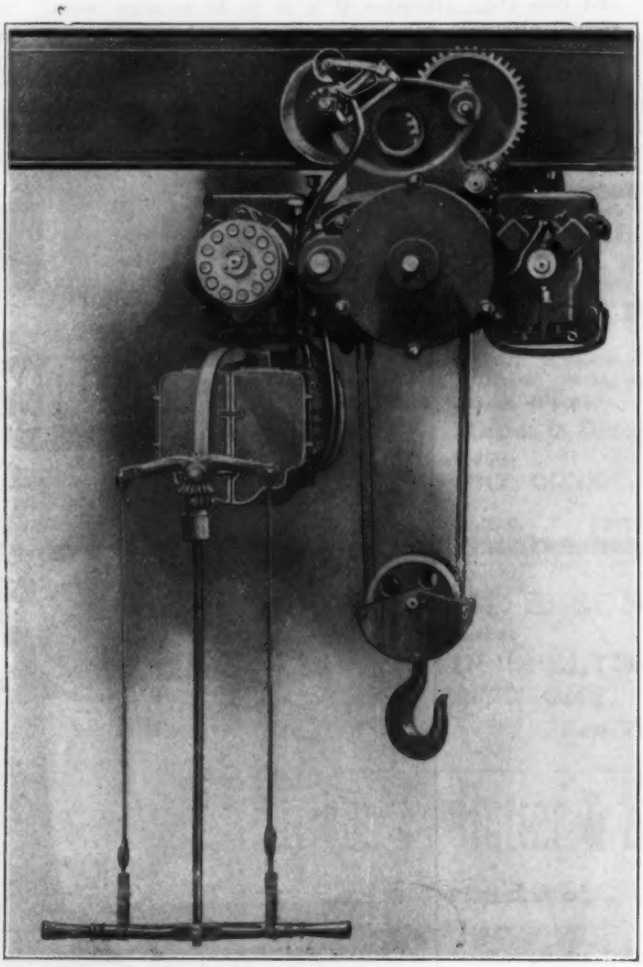


Fig. 2.—The Pawling & Harnischfeger Electric Hoist.

To the lower side of the hoist motor the two reversible and inclosed controllers E and F are attached. The controlling device is in the form of an outrigger, which permits operating the hoist without the operator interfering with the work. One lever controls both the hoisting or lowering and also the trolley travel in either direction.

A turn of the controlling bar in a horizontal plane effects the trolley travel through bevel gears and a quill shaft extending to the corresponding controller, while a tilting of the same handle actuates the hoist motor through a rock shaft extending through the quill to the other controller. Both motors can be reversed by simply changing the direction of movement of the bar, and both motors can be operated simultaneously when desired. The controller connections are so arranged that the motion of the operator's hand is in the same direction as the motion of the machine; for instance, the elevation of the right hand end of the handle bar causes the hook to raise.

The motors are each 2½ horse-power, and the maximum hoist speed is 30 feet per minute for full load and 75 for light load. The maximum trolley travel is 350 feet per minute for full load and 400 for light load. The machine described is one of 12 that are now being installed in the Altoona wheel foundry of the Pennsylvania Railroad Company. Those so far in service are being used for handling flasks and patterns, for pouring, and for transferring the hot wheels to the annealing furnace with great rapidity. To permit this rapid transfer the machine is given the high trolley travel, as above mentioned.

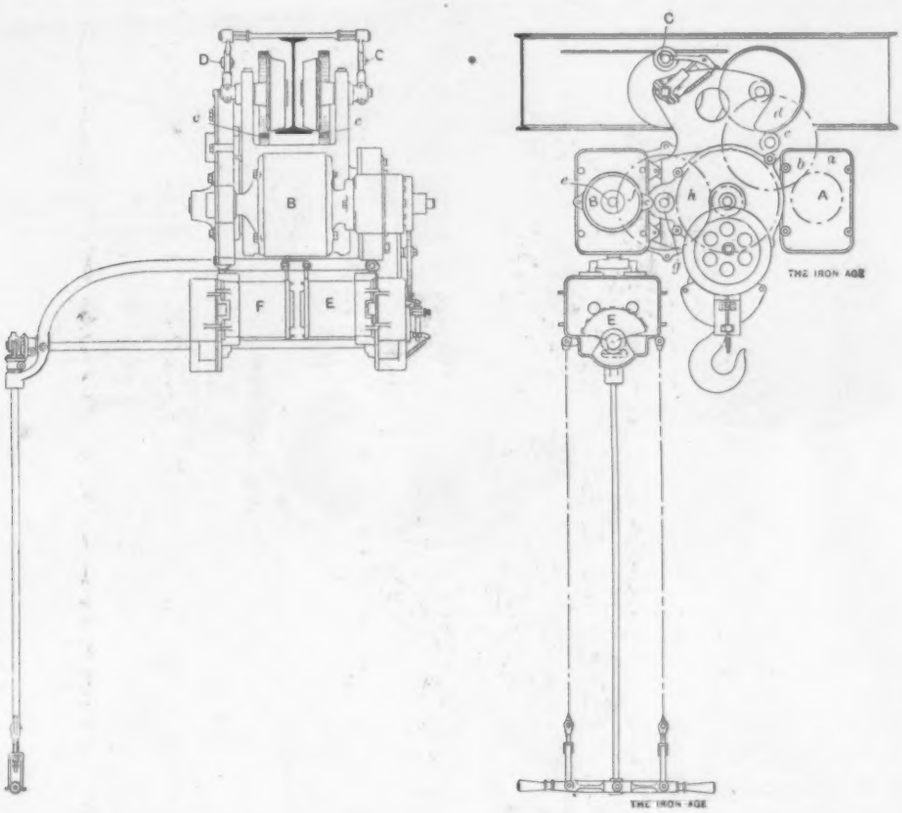


Fig. 3.—Side and End Views of the Pawling & Harnischfeger Hoist, Showing Gearing for the Drive.

Fig. 4 shows a new type of hoist built by the Niles Tool Works, Hamilton, Ohio, in capacities of ¾ to 6 tons. It may be used either as a hoist, in which case it runs on I-beams, as illustrated, or it may be mounted on a traveling bridge and used as a small capacity crane. In the latter case it is arranged to run between the two I-beams or channels of the bridge, and the controllers for raising and lowering the hook and operating the traversing mechanism may be placed either on the hoist or the bridge and operated by cords from the floor, or in an operator's cage attached to the bridge.

When used on an I-beam the controllers are attached to the hoist and operated by cords from the floor. These hoists will run on straight and curved tracks and are usually provided with a separate motor for traversing, but, if desired, hand traverse may be furnished, or all the traversing mechanism may be omitted and the trolley moved along the track by pushing on the load. The increased service of the electric traverse, however, usually more than compensates for the slight additional cost. The hoist is self contained in one heavy cast iron frame, to which the motors are attached end on, and the power is transmitted directly from the armature shaft to the drum shaft through one train of worm and worm wheel gears. The traversing mechanism is driven through a train of worm and worm wheel gears similar to the hoisting mechanism, except that when the trolley is arranged to run on a single I-beam a double set of transmission gears is used to connect the worm gear shaft to the truck wheel shafts. All the mechanism is inclosed in oil and dust proof casings and is noiseless in operation. In addition to the braking effect obtained by the use of the worm and worm wheel a powerful electric brake is attached to the hoist motor.

The Utah Iron Ore Fields.

No important exploration is now under way in the iron ore fields of Southwestern Utah, where the Colorado Fuel & Iron Company, S. B. Milner of Salt Lake, R. B. Dear of the Mesaba range, and some Duluth parties have been at work the past two or three years. The former company has expended about $500,000 and has completed its purchases and preliminary developments; S. B. Milner is arranging his affairs for the erection of a steel works near Provo Lake, not far from Salt Lake City, and has a small force in the mining region; the Duluth parties are simply carrying on patent work and securing Government titles.

It may be stated that work done there has been almost entirely satisfactory; absolutely so in most cases. The Colorado company dropped a large acreage to which it had acquired preliminary title, at the time that Eastern interests became heavily interested in the concern a year or so ago. They were averse to retaining wild lands, even though they may have a possible value for ore. Explorations by some of those interested in the district have now continued the field a long distance southwesterly, and it is safe to say that the Iron County district extends from the immediate vicinity of Parawan, Utah, through Cedar and Hebron to the vicinity of Clover Valley, Nev., a distance, according to the surveys, of 90 miles. Some of the best ore yet found there, a beautiful blue hematite, both massive and soft, has recently been

uncovered 60 miles from the earlier explorations. From these newer finds it is 300 miles to the important Pacific harbor of San Pedro, near Los Angeles.

Drill holes recently driven in the older part of the district by the Colorado Fuel & Iron Company have shown the ore bodies to be of such depth as to eliminate the possibility of early exhaustion. One hole after passing through an upper ore lens and through a lime footwall, cut nearly 200 feet into an underlying hematite bed, consisting of very high grade ore.

S. B. Milner states that he will be able to erect the works he plans for the utilization of these ores as soon as he is able to get proper rates for the assemblage of ore from his mines in the new fields and of coal from properties that have been proved valuable for coking, lying in the mountain to the east, along the Denver & Rio Grande road. These favorable rates he expects to secure shortly.

The new W. A. Clark railroad, building from Salt Lake to Los Angeles, will be completed through and will run trains by January 1 next, according to statements of its leading officials. Three thousand men are now at work connecting the ends of the road. It is current rumor through Southern Utah that the Denver & Rio Grande has either let contracts, or is preparing to do so, that will give it a new southwesterly line from Green River, in the east central part of the State, to a junction with the Clark road near the Nevada line, which will take it directly along the trend of the Iron County ore fields. There is good ground for the belief that this rumor has some foundation in fact.

It would seem that the logical location for the manufacture of these ores is neither at Pueblo nor near Salt Lake, but on the Pacific Coast or at some point between the mines and the coast, where fuel and water may be available, for the ultimate destiny of these ores is to assist in supplying the Pacific and Oriental trade. For that they seem well located and of proper quality.

D. E. W.

"A New Departure in Technical Education" is the title of an interesting article in *Page's Magazine* for October which describes an experimental mine at the University of Birmingham, England. It occupies nearly an acre and is a replica of the workings of a small coal mine, which offers the best opportunities for studying such mining problems as underground transportation and winding, local and general ventilation, prevention of accidents from explosions of gas and coal dust, timbering methods in loose ground and under heavy pressure, and the laying out of underground workings to the best advantage. The material excavated is soft gravel and the "cut-and-cover" system of tunneling has been adopted in its construction. Both walls and the flat roof will be made of concrete, to imitate the seam of coal and the stone roof of an actual mine. The mine will be ventilated in an approved manner, and the students will have facilities for studying air crossings and regulators, splits and scales, as well as the measuring of air volumes and velocities. The "long-wall" and "board-and-pillar" methods of working coal, of which all other systems are modifications, will be exemplified in the mine. Probably the mine will be of greatest utility for instructing in underground surveying and leveling and the connection of underground and surface surveys. The students themselves did the original surveying and leveling and pegged out the workings before excavating was begun.

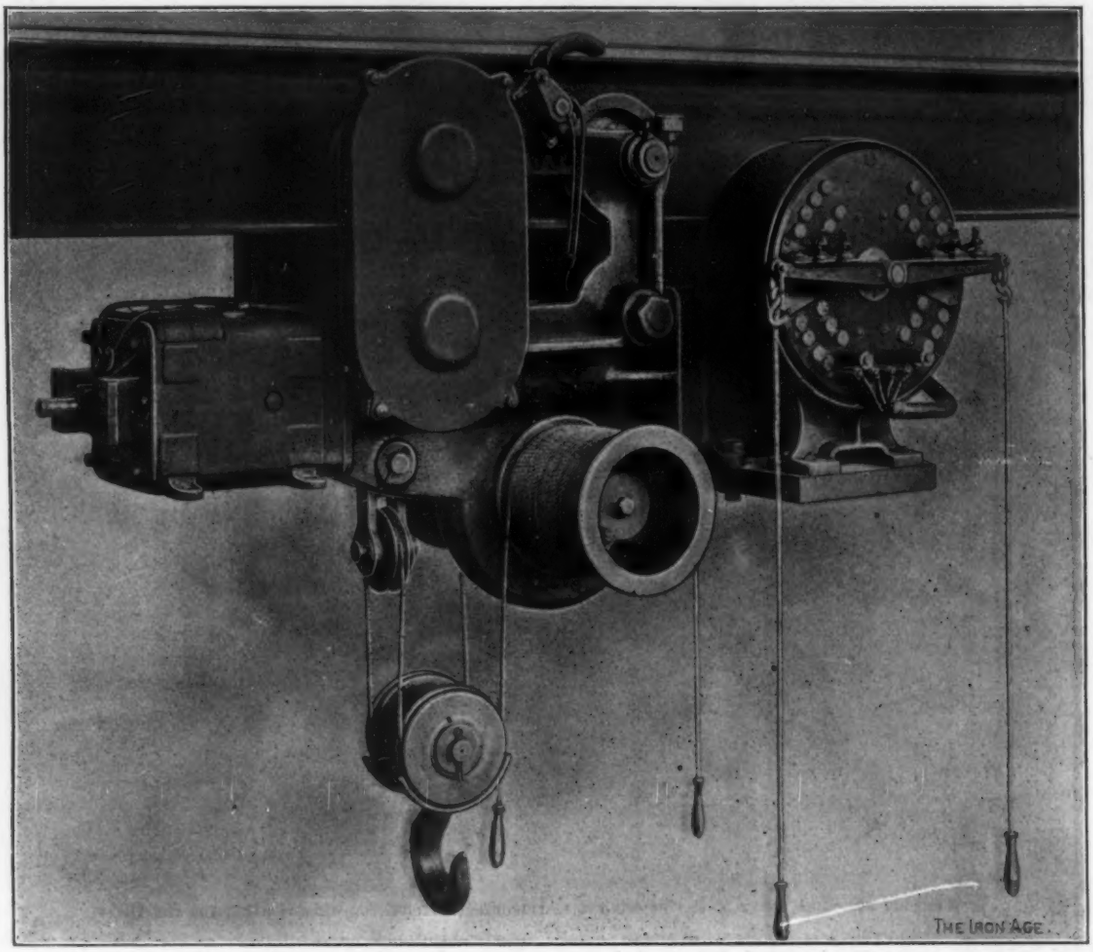


Fig. 4.—The New Niles Electric Traveling Hoist.

Wickes Brothers, Saginaw, Mich., dealers in boilers and second-hand machinery, have opened an office in the Empire Building, Pittsburgh. P. J. Brennan will have charge of the machinery department and J. A. Shepherd will look after the boiler department.

The Huber Hydraulic Press at the World's Fair.

The only heavy hydraulic exhibit at the World's Fair is the Huber press in Block 35 in Machinery Building, hence it is one of the most prominent exhibits in that building. Its great size is the feature which attracts, but it also excites interest from a scientific viewpoint in that it shows an entirely new process of metal working. The process and the press are the invention of Carl Huber, a consulting engineer of Berlin, and patents have been granted him in the United States on the invention. The press exhibited and which is described herewith was manufactured at the famous Krupp Works in Essen.

By this new process ornamental articles, such as vases and cups, &c., and artistically engraved bas reliefs are manufactured, the power medium being water or any other liquid under a very high working pressure. Hitherto it has been necessary to use heavy bars of steel, but in this press this expensive feature is eliminated. Another important and noteworthy improvement is that the heavy matrix formerly required in the general pressing process is dispensed with, because the water pressure acts on the sides of the mold as well as the top. The process consists of the pressing of articles in a completely closed receptacle, thus removing the strain from the die and transferring it to the wall of the pressure cylinder. The wall of the die, therefore, may be much thinner, which reduces the cost as well as the size of the die. The decrease in the dimensions of the die is a great advantage, as it makes it possible to have a large number of dies, from two to fifty or more, pressed in one operation.

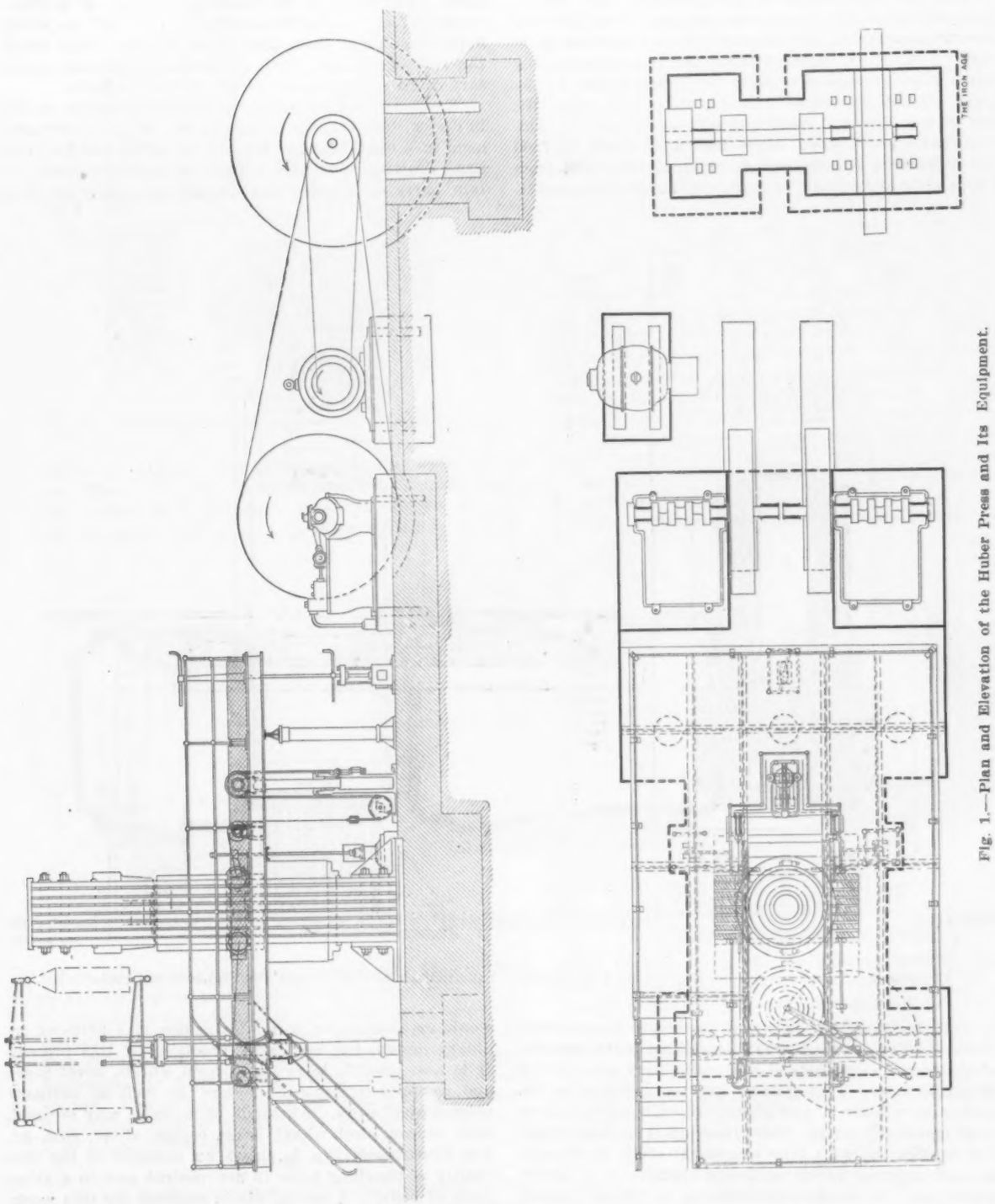


Fig. 1.—Plan and Elevation of the Huber Press and Its Equipment.

The arrangement of the Huber press in connection with its powerful hydraulic pumps is shown in Fig. 1. The space required for the exhibit is 60 x 21 feet. The weighty part of the press is erected on piles, and the whole foundation is of concrete. The motive power is a 70 horse-power direct current, 220-volt Western Electric motor, which is controlled from a switchboard furnished by the Guarantee Electric Company. The controller is a

100 horse-power size and was furnished by the Electric Controller & Supply Company, Cleveland, Ohio. Power is transmitted from the motor to a main shaft which carries two large belt pulleys and one very heavy fly wheel weighing approximately 17,600 pounds. Each of the pulleys has a weight of 2200 pounds. From a coupling on the shaft, not shown in the illustration, a small hydraulic pressure pump is driven which is used only for lifting an accumulator connected to the small hydraulic auxiliary crane for lifting the dies and die basket and setting them in place in the operating cylinder.

Two hydraulic pumps of equal pressure are driven from the larger pulleys, and they are used as preliminary pressure sources of 750 atmospheres or approximately 11,000 pounds per square inch. At this pressure the water flows through the heavy hydraulic piping to the press. It will be noticed from Fig. 2 that the press differs both in type and construction from the usual design. The frame work, which bears the whole strain of 7500 metric pounds, is composed of eight plates rolled from armor plate nickel steel, each plate weighing 8800 pounds. fits into the opening. The problem of packing this piston for the high pressure has been very carefully studied, and it was found that the best result was obtained by the construction which is shown in Fig. 3. The ring B is made of copper and the lower parts are of brass and leather alternately. The whole press stands on a heavy foundation plate, and, strange to say, there are no foundation bolts required. Another piece of apparatus which has not yet been mentioned, but which is necessary for the operation of the press, is an air suction pump which is connected by a small belt to the main shaft. The depth of the working cylinder is approximately 6 feet. The operators work on the platform, which is the same hight above the floor as the track upon which the carriage moves. For all further operations necessary small appliances are placed on this platform.

Some very interesting products of the press are shown in Fig. 4. The two left hand drawings show the arrangement of pressed bearings for railway axles, and the right hand drawing shows the manner of manufacturing certain parts of bicycles and automobiles. Any of these

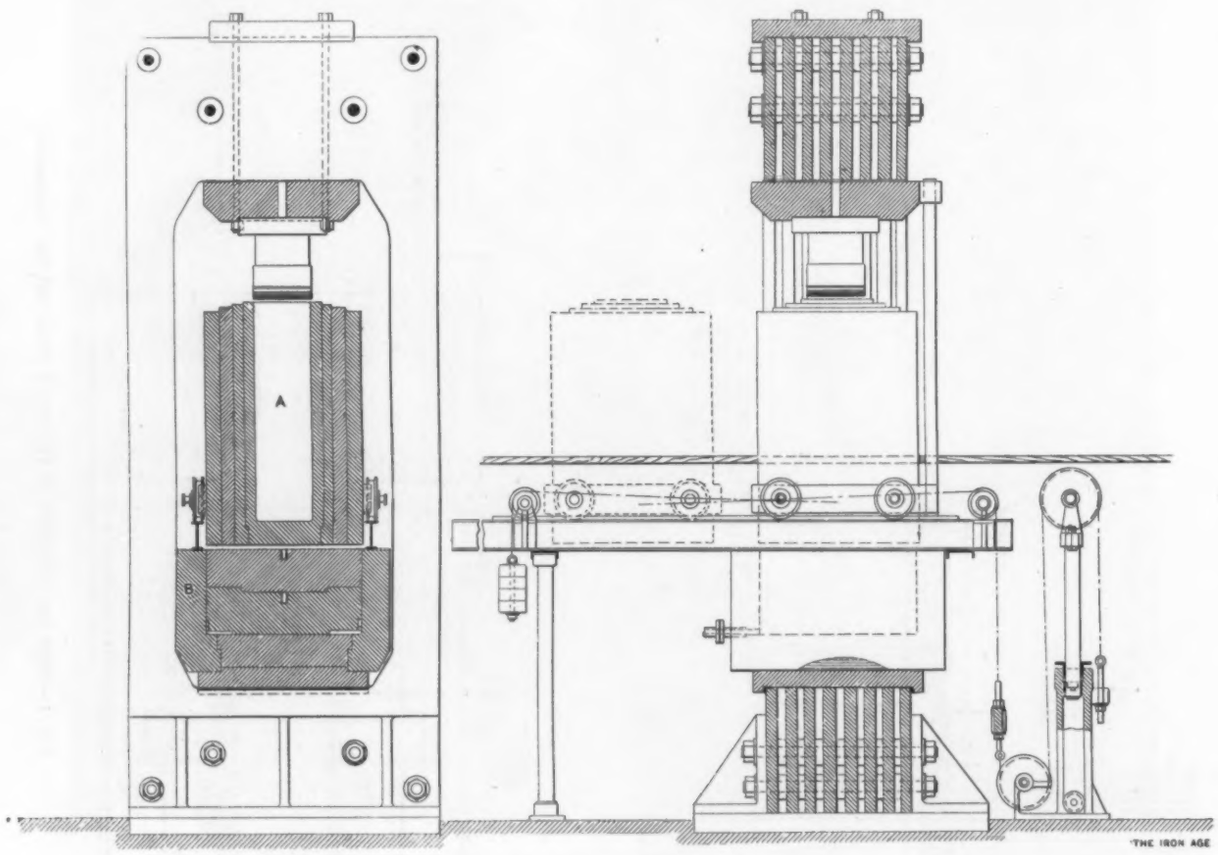


Fig. 2.—Transverse Section through the Cylinders and Longitudinal Section through the Frame of the Press.

The center of the plate is cut out to receive the pressure cylinders. The lower cylinder B, weighing 26,000 pounds, is constructed to withstand the preliminary pressure of 750 atmospheres. This cylinder acts as an intensifier on the second cylinder A and piston, which is placed above in the movable carriage. This cylinder A is remarkable, as it is constructed with four concentric shells in exactly the same manner as the explosion chamber of a heavy 14-inch gun. It stands a pressure up to 105,000 pounds per square inch, although the ordinary working range is only between 80,000 and 90,000 pounds. It may be interesting to add that the exploding pressure of a large naval gun with full powder charge is only one-half of the above mentioned pressure. This cylinder receives the dies, and any additional ones are placed in a special basket. When removing or inserting dies the cylinder moves upon its carriage to the position shown by the dotted lines in Fig. 2, where it is clear of the frame work, and may be served by the basket hoist shown in Fig. 1.

The bottom of the cylinder is solid and the top piston

would be complicated forms to fashion in a press of ordinary design, but are easily produced by this process. It is also possible to produce worm wheels, bevel gears and complicated parts of boilers, as well as ordinary pressed steel work. All kinds of material may be used, such as iron, steel, nickel, brass, copper, silver, gold, &c. The illustration, Fig. 5, shows an example of the possibility of punching holes in any desired spot in a given piece of metal. A special die is required for this work, and one or more dies are placed in the jacket, each bearing reliefs. The left half of the illustration shows the die and the metal plate before the pressure is applied, and the right half of the same figure the die and plate after completion of the operation. In some cases it is not possible to obtain a good impression by one application, and it is necessary to repeat the application of pressure until a satisfactory result is obtained. The work need not necessarily be pressed cold, but may be operated upon in a white hot or red hot conditon. In such cases the water may be replaced by sand or metallic alloys.

The operation starts with the pressing of the raw

material in the die, and both together are pressed in the steel jacket. To prevent water from entering between the die and the product tight packing is placed around

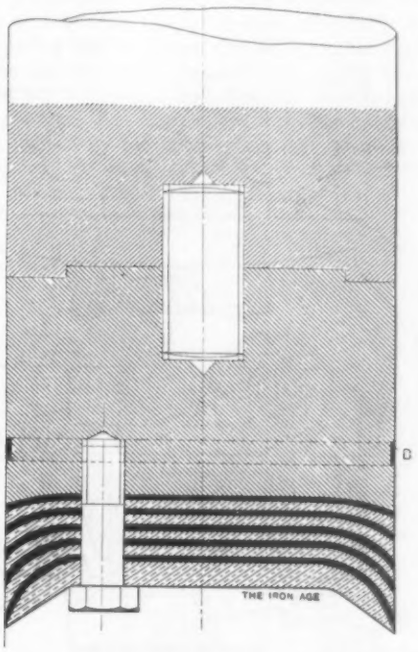


Fig. 3.—Cross Section of Piston, Showing Method of Packing.

the jacket inside of the product consisting of a rubber bag. The air between the product and the die sometimes has a tendency to spoil some very fine designs, and for this reason it is necessary to remove the air by suction before the pressing process is commenced. This is done by the air suction pump previously referred to.

The following weights of the press parts are interesting: Foundation plates, 10,500 pounds; pressure cylinder, 25,000 pounds; accumulator for the auxiliary crane, approximately 10,000 pounds. Each of the pumps 10,000 pounds. The entire weight of the press is 270,000 pounds. The Huber press is exhibited by the Orvit Company of Koln-a-Rhein, Germany.

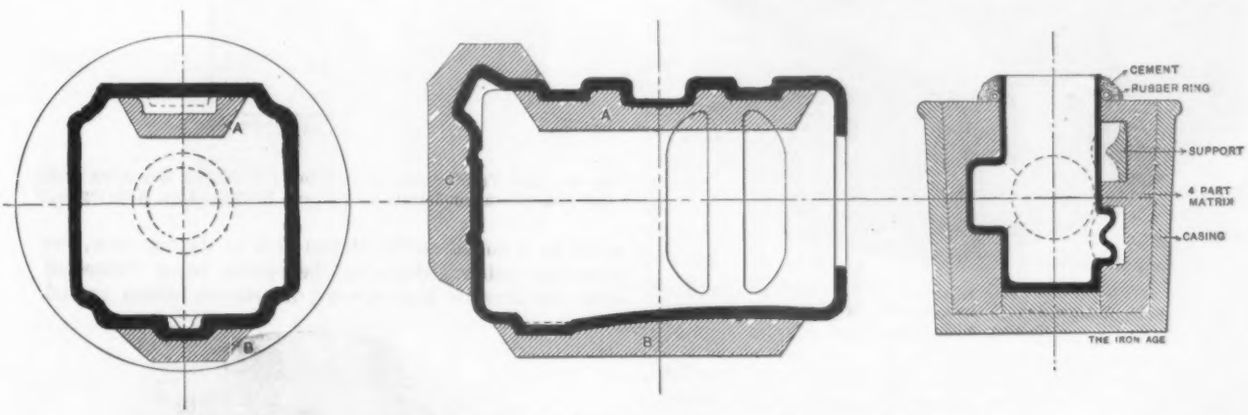


Fig. 4.—A Few of the Irregular Shapes Which the Press is Capable of Forming.

Trains on the Long Island Railroad operating in the vicinity of New York are to be operated by electricity, plans for the work being already completed. This system will embrace about 100 miles of track and it is expected to be ready for operation by next spring. For several months the new power house has been under construction at Long Island City and will be finished early next year. The third-rail system will be used for the most part, and it is intended that eventually passengers may be able to ride without changing cars from the new Pennsylvania station now being erected at Thirty-third street and Seventh avenue, in New York, to Manhattan Beach, Rockaway Beach, Far Rockaway and Arverne or any intermediate points.

Lake Iron Ore Matters.

DULUTH, MINN., October 22, 1904.—The ore trade of the eastern end of the lakes is gradually coming round to the opinion that shipments from Lake Superior this season will be nearer the figure that this correspondence has stood by all the year—that is, 20,000,000 gross tons. From the beginning of the season it has been most evident that the total was to be materially more than they admitted. October will show gross shipments of nearly 4,000,000 tons, all ports, and the November estimates are large. There yet remain large amounts of ore in stock at many points that are to be moved forward, and the United States Steel Corporation will be actively shipping for a considerable period.

The annual report of Mine Inspector Festrail of Dickinson County, Mich., in which are situated the mines at Iron Mountain, Norway and adjacent points, shows that there was a decrease of 1,000,000 tons in production for the year ending with September 1 last. This decrease was 300,000 tons at Chapin, 230,000 at Aragon, 150,000 at Cundy, 100,000 at Penn group and 75,000 at Pewabic. In the year 3000 men were employed, a diminution of 1000. There were only nine fatal accidents in these mines during the year, or but three to the thousand, which is even a better record than that of the copper mines, and far ahead of the adjacent county of Iron, where there were 17 accidents to the thousand men employed. In ore mined there were 189,600 tons to each fatality for the year. The amount of ore mined diminished during this year proportionately more than the number of men, as mines, when reducing their shipping operations, pushed their development work faster than usual, and this, I take it, can be regarded as a splendid commentary on the business acumen and stability of the companies operating in that district.

Plans have been made for unwatering Great Western mine, Crystal Falls, by the blowing method, and the work starts next week. The blower will be large enough to handle 2000 gallons a minute and will keep the large open pit free from water permanently. It is this pit draining underground that has made the trouble

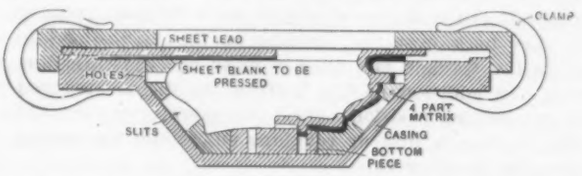


Fig. 5.—Cross Section through a Die; One Half Showing the Work Before and the Other Half After Being Pressed.

for the company. The same company has a new hoisting plant coming for the Tobin mine, and it will be worked heavily the coming year. Tobin is a large and successful new mine and is of great value. Beta mine, which is controlled by Pewabic people, is a shipper and will send out a few thousand tons this year.

Few changes have taken place of late upon the Mesaba. The report that open pit mines would close November 15 is premature and they may be open longer. A deal

for the purchase of Forest is under consideration, and several other properties are in negotiation for sale to various parties. The Canisteo Mining Company, controlling more than 125,000,000 tons of lean sandy ore in T. 56 R. 24, has placed F. L. Coventry, late of Antoine Ore Company, in charge of explorations and experiments. The company is experimenting along the line of washing these ores and raising their percentage to a high grade Bessemer, and is meeting with reasonable success. Explorations have been under way for two years on lands controlled by the company and in, or near, 56-24.

D. E. W.

The Diamond Self Opening Die and the Diamond Tapping Attachment.

The self opening die and tapping attachment shown in the accompanying illustrations are new products of the Charles G. Allen Company, Barre, Mass. The new self opening and adjustable threading die shown in Figs. 1 and 2 is designed for use on turret lathes, screw machines or ordinary lathes in place of solid dies. It can be used for cutting either right or left hand threads of standard or special pitch, as well as for standard pipe threads within its capacity. The construction allows the threads to be cut close up to the shoulder if desired, and the shank being hollow, any lengtn of thread may be cut. The dies open automatically when the travel

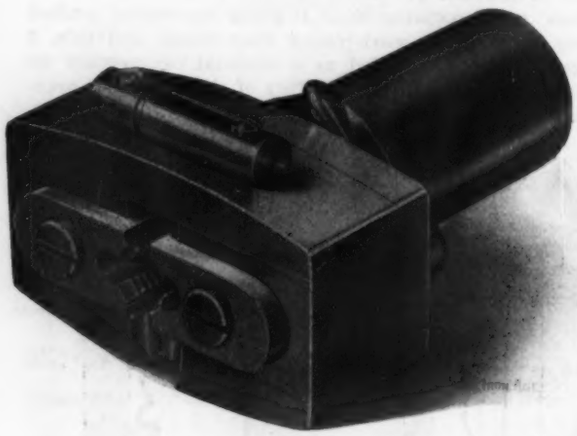


Fig. 1.—The Diamond Self Opening Die in Locked Position for Taking Finishing Cut.

of the turret head is stopped, and in ordinary practice the turret stop is set to govern the travel of the turret and the length of the thread to be cut. However, the dies may be opened at any time by simply holding back the lever or turnstile by which the turret slide is traveled.

Fig. 1 gives the general appearance of the die, but its construction may be better understood by reference to Fig. 2. The main object in all dies in which the threading jaws are separated is to allow their being opened to permit the withdrawal of the work without running the dies back over the threads, as this is inclined to injure the threads and quickly wear out the threading teeth. In addition to this feature the die is arranged for two cutting positions, one being more open than the other to take a first or roughing cut, while the second takes the finishing cut.

Referring to the side view in Fig. 2, *j* is a stationary holding stud set in the base plate *c*, which is secured to the hollow shank of the die head, and *h* is a movable holding stud pivotally mounted on the base plate. Adjustably mounted on the studs *h* and *j* is the case for the die holders *d*. This is movable upon the studs toward and away from the base plate, the limit of its forward movement being regulated by a stop screw, not shown. The case *d* has a transverse way into which the separable die holding pieces are fitted, which is better shown in the plan view. These die holders, *e e* in the elevation, have extended flanges holding them in place in their slot. The two-part dies are mounted in these separable slides, each being fastened in place by fastening screws, and the adjustment for cutting position is regulated through end screws, *f* and *f*. Normally the die holders are held

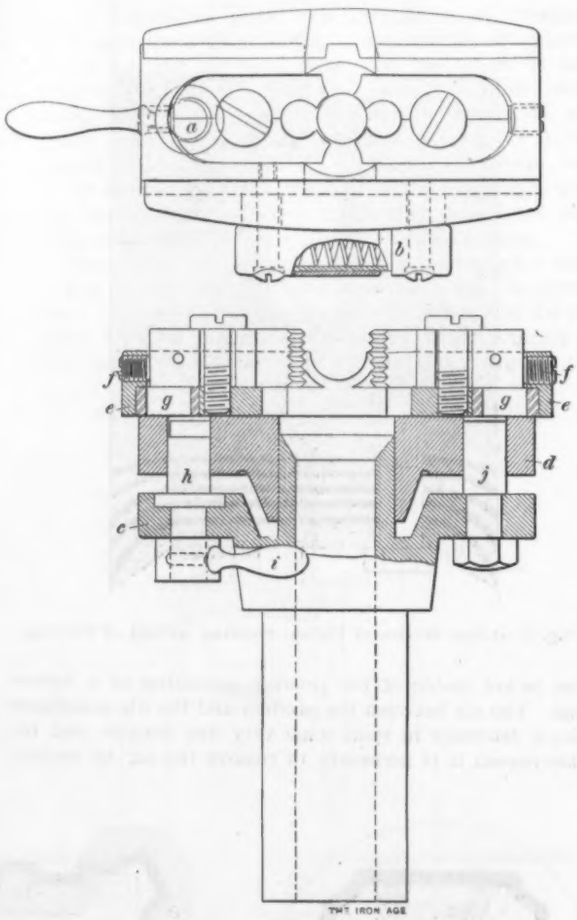


Fig. 2.—End View, Showing Position for Taking Roughing Cut, and Side Elevation Partly in Section, Showing Dies Wide Open.

apart by a coiled spring shown at *b* in the top view, the telescopic tubes containing the spring being connected with the dies by long screws, as shown, which extend

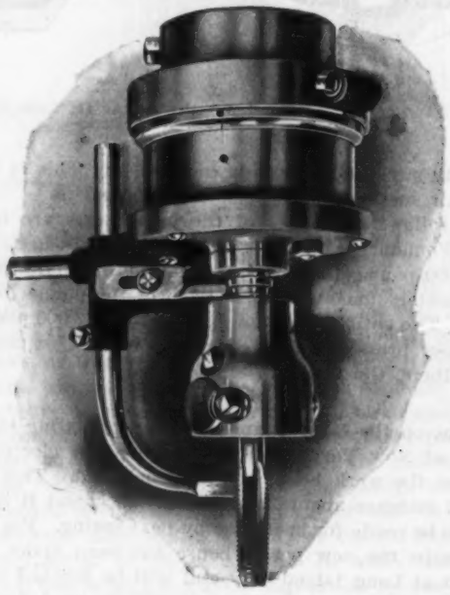


Fig. 3.—The Diamond Tapping Attachment Provided with Depth Gauge.

through slots in the guide pieces. It will be noticed that the stud *h*—top view of which is seen in the other view at *a*—has an eccentric at one end which engages one of the die holders, and secured at the other end of the pin

is an operating handle, *i*. The parts of the die are first set to the position shown in the top view with the handle *i* pointing outward and the holes *g g* in the hardened steel bushings fitting over the studs *h* and *j*. The work is then entered between the cutting jaws of the die until the feed is stopped, when further operation causes the head to be drawn away from the base plate until the holes *g* and *g* slip off from the studs. The spring then causes the die holders to separate, this being the position shown in the side view, and the die may be withdrawn from the work. This first operation cuts a screw thread slightly larger in diameter than the desired finished

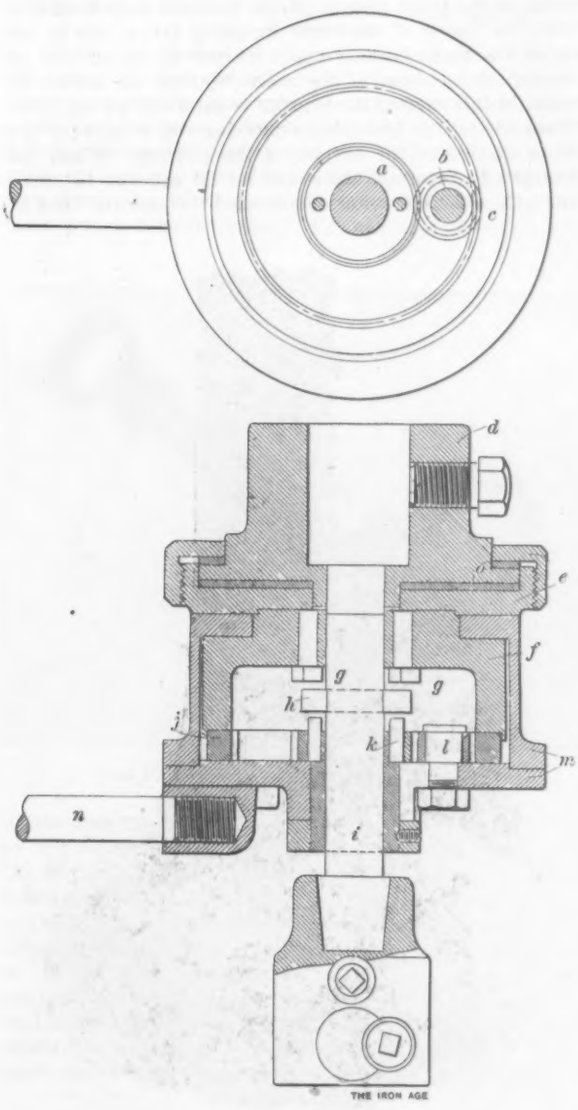


Fig. 4.—Plan View and Vertical Section of the Tapping Attachment.

thread. The die is then closed again, the handle *i* is turned to the position indicated in the side view, and by again running the die over the work a finished cut is taken. To reset the die it is, of course, necessary to press the die holders until the holes *g* and *g* coincide with the ends of the studs, when the head is pushed against the base plate and the die locked.

A notable feature of the new die is that there are no cams or parts liable to wear or get loose in the parts concerned with the automatic opening of the die, and that the construction is extremely simple. A point of advantage will be recognized in the long bearings of the die holder, which tend to keep the dies at all times in perfect alignment, insuring the cutting of straight threads with correct lead. The dies, being made in two parts, may be easily ground when occasion requires. The roughing and finishing feature is incorporated in all dies ½ inch in size or over. At present this die, which is known as the Diamond self opening style A, is made in six sizes, increasing by ¼ inch from ¼ inch to 1½ inches. Each of these styles has a somewhat greater range of capacity than is indicated, by the substitution of other chasers or dies. For instance, the largest size may be used to cut threads from ⅝ to 1½ inches.

Figs. 3 and 4 show the new Diamond tapping attachment, which may be used on an upright drill or similar machine. A notable feature of the device is that no reversing mechanism is required on the drill press, as the attachment drives the tap in, stops automatically and backs the tap out with quick return by simply raising the drill spindle. It is manufactured with either positive or friction drive, the friction drive being that illustrated in Figs. 3 and 4. This is claimed to be very sensitive, a great saver of taps and also useful for tapping to the bottom of a hole. An adjustable depth gauge is used in connection with all sizes except the smallest, being applied as indicated in Fig. 3. There is also a movable slide which may be advanced into a groove in the spindle to hold it in its upper position, preventing the reverse drive from taking effect when it is used for drilling instead of tapping. The mechanism is attached to the drill press by slipping the driving flange over the spindle and clamping with the set screw shown. If it is impracticable to attach in this manner, the driving flange is bored to receive a taper shank to fit the hole in the spindle.

The action of this device will be understood from reference to Fig. 4, which shows a sectional side view and plan view. The driving plate *d* has interposed between it and the casing *e* fiber friction disks, *o*. The screw collar which regulates the pressure on these friction surfaces is tightened sufficiently to drive the tap for normal working, but to allow the surfaces to slip when the tap strikes the bottom of the hole or is strained to a point at which it is likely to break. The forward drive of the tap is obtained from the driving flange *d* through the friction disks *o* and the flange *f*, which carries lugs *g g*, engaging a pin, *h*, on the spindle. If the tap is not reversed before it strikes the bottom of the hole the friction surfaces slip. To reverse it at any point it is only necessary to raise the drill press spindle, which causes the pin *h* to engage with the lugs *k* on a small pinion surrounding the spindle of the attachment. This pinion, shown at *a* in the top view, engages with an intermediate pinion, *b*, which in turn meshes with an internal gear connected with the flange of *f*. This gives the spindle attachment a speed in the reverse direction which is twice that of its forward speed, and backs the tap out very rapidly. The pinion *b* is mounted on the lug *l*, as shown. The rod *n*, which connects with the lower face of the head, is used to prevent the device from turning while in operation. The action of the depth gauge, shown in Fig. 3, is to raise the head with respect to the tapping spindle and cause the spindle to reverse when the tap has entered the work up to that point.

These tapping attachments are made in five sizes, with a maximum capacity of ⅜, ¾, 1, 1¼ and 1½ inches, respectively.

Among recent installations for heating and ventilating public buildings is that for the Worcester City Hospital at Worcester, Mass. The buildings, seven in number, are located a short distance from the center of the city at the top of a long hill, and are therefore exposed to severe weather in the winter. In the new ward building a slow speed Sturtevant fan located in the basement draws the fresh air from the top of the building, a distaince of about 45 feet, through brick flues and into galvanized iron ducts to the tempering coil, where the chill is taken from the air. It is then forced through a heater containing coils of 1-inch steam pipes inclosed in a fire proof steel plate jacket. Thence it passes to the plenum chamber, which is divided horizontally into two chambers, one for the hot air and one for the tempered air, the latter passing underneath the heater from the fan. By means of mixing dampers, automatically controlled, the air is regulated to the desired temperature and is forced through the distributing ducts to the different rooms. To insure positive ventilation in the rooms, a Sturtevant electric propeller fan located in the basement

exhausts the vitiated air through galvanized iron ducts connecting with registers in the floor and discharges it outside.

The American Blower Company's New Vertical Engine

A small vertical engine, illustrations of which are given herewith, has recently been placed upon the market by the American Blower Company, Detroit, Mich. The most noteworthy feature of this engine is its oiling system, which has been given attention almost equivalent to that given to the lubrication of large horizontal engines. That small engines have not usually been as carefully designed with respect to automatic lubrication as large engines is rather unfortunate, for defective lubrication on a small high speed engine is more annoying even than on a large one. The engine, as shown in Fig. 1, is fully inclosed, which prevents foreign matter from getting into the working parts. At the same time the interior

Fig. 1.—The Type A Vertical Engine Built by the American Blower Company.

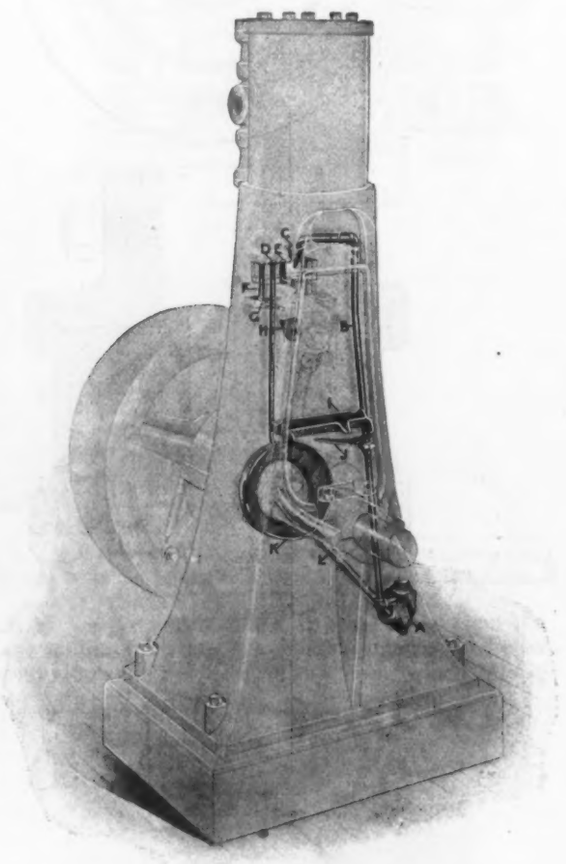


Fig. 2.—Transparent View of the Same Engine, to Show the Oil Distributing System.

is easily accessible by removing the cover plates, this being done by turning a milled hand nut and lifting the plates out by means of their attached handles.

The splash system of lubricating the rotating parts is not employed, as it was not considered to be as effective and reliable as the one which has been devised. This system is a departure from usual methods, and by it every frictional surface is claimed to run on oil without contact between metals, with the effect of greatly eliminating wear. The oiling is performed by the engine itself, each bearing having a stream of oil instead of a drop or two a minute. Fig. 2 brings out the oiling system. An eccentric, K, on the shaft actuates the plunger L on the oil pump A, forcing the oil up through the pipe B into the small strainer C. From C it drops into an oil box, from the bottom of which four tubes lead. These tubes project up on the inside of the box and have slots as inlets, so that when the oil box contains only a small amount of oil each tube can take only its proper proportion. When the box is full all the tubes get more oil in proportion, according to the increased hight of the oil level. Two of these tubes, F and C, and two on the opposite side (not lettered) convey oil to the guides, the oil dropping into a small oil trough, G, from which it runs into the bearing through a small oil hole. The cross head pin is supplied by the pipe E, the oil dropping into the cup H and filling the cavity between the bolt and inside of cross head pin and the oil grooves. The oil dropped from the cross head is caught in two pans attached to the inside of the cover plates. From these oil pans it drains down the inside of the cover, dropping into a cup in the top of the main bearing cap. Instead of oil grooves at the top and bottom of the main bearing, as ordinarily made, in this system the bearing is cut away at the joint. When the strain from the connecting rod is upward the oil is carried to the bottom of the bearing. When the pressure is reversed there are no oil grooves to carry away the oil. The crank pin is oiled through the tube D, which discharges into a crank oil ring inside the eccentric K, which in turn discharges into the crank pin oil tube and flows across the crank pin bearing. The crank pin oil ring, in addition to its independent supply, catches the drip from one end of the main bearing. The eccentric is oiled by the drip which it catches from the other end. Very little difficulty has been experienced in catching the oil thrown off from the eccentric strap, and the splash from the cross head has been equally easy to care for, the outside of the engine being absolutely free from oil. A portion of the oil as it drops back into the bottom of the frame falls upon an oil filter and is thoroughly cleaned and purified. The large base gives the oil an opportunity to cool and settle before it is returned again to be circulated through the bearings.

In a test made in the manufacturer's shop an engine was adjusted and filled with oil on March 10. Up to July

15 no adjustments of any character had been made and no oil had been added, except to fill the sight feed cylinder lubricator. This engine has been operating from 14 to 16 hours per day driving a blower, and after a lapse of over four months needed no adjustment or fresh lubricant and was running almost as noiselessly as at first.

It will be seen that this engine is particularly applicable for use where continuous operation is required or peculiarly heavy duty is imposed upon the engine, as in driving blowers, dynamos, pumps, &c.

The Philadelphia Pneumatic Deck Calker.

An interesting piece of equipment for shipyard work is the pneumatic deck calking machine shown in the accompanying illustration and made by the Philadelphia Pneumatic Tool Company, Philadelphia, Pa. This consists of a Keller pneumatic riveter which acts direct upon a circular sharp edged disk, the whole being mounted upon a four-wheel frame, so that it may be traveled along the seam which is to be calked. By means of the latch pin

The Philadelphia Pneumatic Deck Calker.

at the side the riveter may be swung about its trunnion to any of three different angles to drive the wheel into the seam to the required depth. The oakum or other calking material, whatever it may be, is carried on the reel and is fed through the conical funnel in front of the disk and in line with it, and is driven down into the seam as the machine is pushed along. The vibration of the machine assists in moving it. It is believed this machine will save a great deal of hard labor and prove a very acceptable tool, as it is capable of performing its work much faster than was possible by the old hand methods.

An Eight-Hour-Day Clause Illegal in City Contracts.—A decision declaring that an eight-hour-day clause in a city contract is illegal in that it restricts bidding, has just been rendered by Judge L. W. Halsey, of the State Circuit Court at Milwaukee, Wis., last week. The decision was in the action brought by T. J. Neacy and Walter Read of the Filer & Stowell Company against the city of Milwaukee and the William Tod Company, Youngstown, Ohio, to restrain them from carrying out a contract for a 20,000,000-gallon pump, which contained the objectionable eight hour a day clause. In this case organized labor took great interest, and two of its representatives were permitted to interplead as defendants, they making the claim that the city attorney had expressed himself frequently as believing that such a clause was contrary to law, and that because of his personal bias he could not successfully defend the action. The decision of the court does not dwell so much upon the legality or illegality of such a clause, but is to the effect that such a clause "lessened and restricted the number of bids, and thereby increased the price by many thousands of dollars, and is in direct violation of a section of the city charter which requires that 'all contracts shall be let to the lowest bidder.'" It is stated that the case will be carried to the State Supreme Court by the Federated Trades Council, and in the meantime Milwaukee chafes at the delay in securing additional pumping facilities for its North Point water works.

The Coking Coals of Alabama.

L. A. O. Gabany, chief engineer of the Alabama Coal, Coke & Iron Company, presented (July 7) a very interesting paper on the treatment and economic preparation of the Alabama coals for coke manufacturing to the Birmingham section of the Engineering Association of the South, which is printed in the society's *Proceedings*, just issued for the last quarter. It is a very practical discussion of conditions in the Southern coal mining industry and severely criticises some of the methods pursued. Some of the information given will be read with great interest by iron manufacturers as well in the South as elsewhere. The following extract has been deemed particularly worthy of reproduction here:

"In order to make good coke, suitable coal is required; and, of course, only coking coal can be used. Alabama has 23 veins of coal, of which 14 veins are coking coals. Out of these 14 coking coal veins only 9 coal veins are suitable for making coke. The other veins are all too high in sulphur, and for that reason I will not consider them in this paper. Apropos, I have in my possession of recent date two reports on coal property. These reports are written in the most refined manner, with selected words out of the English grammar, and I must say that the scientific expressions in them lead me to believe that the writers of these reports are intelligent men. One of the reports describes a piece of property in which the writer claims to have, and can show up by test pits, 42 workable seams of coal; in fact, the property is cut up by faults and has only 3 seams of coal. The other report is from a different part of the State, and the writer claims to have 7 workable coal seams; in fact, it contains only one disturbed 18-inch coal seam, which stands on its end. The reader will perhaps be surprised to see my claim of only 23 veins of coal.

"The 9 coking coal seams are not in such condition that any one seam could be used by itself or without preparation for coke; and outside of the Black Creek, Cardiff, Pratt, Carter and Milldale seams, all other seams are very much intermixed with slate partings, and the above-named 5 coal seams cannot be mined clean enough, owing to the smallness of the seam and the brittle slate top or bottom, which in mining invariably will be mixed with the coal, which impurities have to be separated through washing.

"The 9 coking coal seams do not make good coke even after washing, and in most cases the different seams have to be thoroughly mixed with it in order to make good coke. For instance, the Black Creek coal seam produces a spongy coke, very low in ash (from 5 to 7 per cent.), so that its structure and texture for furnaces are very troublesome; but by mixing it with another seam of coal it makes a good coke. The Blue Creek, Horse Creek and Newcastle coal seams are all very dirty seams, and even after washing they are high in ash—from 15 to 17 per cent. The Cardiff and Pratt coal seams have to be washed on account of their impurities, and then the coke contains from 10 to 12 per cent. of ash and over 1 per cent. of sulphur. The Carter and Milldale coal seams are both small seams, and have to be washed on account of the impurities through mining, and then they produce a spongy coke—ash, 8 to 10 per cent; sulphur, 0.7 to 0.9 per cent. The Brookwood coal seam is a dirty seam, and has to be washed. By itself it will produce a fairly strong coke, but it is high in ash—15 to 16 per cent.; sulphur, 0.8 to 1.0 per cent.

"The best coke in Alabama can be made out of a mixture of the Milldale coal seam and the Brookwood coal seam when washed—namely, three parts of Milldale and one part of Brookwood. The coke of this mixture contains 10 per cent. ash and 0.750 per cent. sulphur, never over 10.5 per cent. ash and 0.900 per cent. sulphur. The structure is hard, firm and in long pieces; the texture is dense. It is the best foundry coke, equal to the standard Connellsville coke."

The Application of Dry Air Blast to the Manufacture of Iron.*

BY JAMES GAYLEY.

The atmosphere, which plays such an important part in the manufacture of iron and steel, is the most variable element to contend with in its several processes; and particularly is this true of the blast furnace process, which consumes air in large quantities. At no time since the blast furnace became an important and widely used apparatus—even when it was operated in the most crude manner—have the variations in composition of the raw materials used been as frequent and as great as the variations in humidity of the atmosphere. Great and important improvements have been made in the blast furnace and its accessories, as in the hot blast stoves, the increase in size and change in the shape of the furnace, more efficient blowing engines, the increased protection given to the bosh walls, and in the careful preparation of the raw material, all of which have exerted a pronounced influence on the furnace operations from a metallurgical standpoint. During the past eight years but little advance has been made in this direction; the fuel consumption has not diminished, nor has there been any material increase in production. Within this period, however, there has been witnessed the greatest development in appliances for the economical handling of material, and so complete has been the work in this direction that, except in isolated cases, in this country at least, a further extension does not hold out much promise of a satisfactory return on the investment required. It seemed that, with the exception of the gas engine, we had about reached the limit, for, like a strong wall, the atmosphere, with its humidity as variable to-day as when first blown into a primitive blast furnace, appeared to stand as a barrier to further progress. In furnaces using ore from the Lake Superior district the raw material, amounting to about 7200 pounds per ton of iron, varies in composition within 10 per cent. and is as uniform as human skill can make it; but the atmosphere, of which 11,700 pounds are consumed per ton of iron, varies in its content of moisture from 20 to 100 per cent. from day to day and often in the same day, thus rendering the process, even with the best appliances, an uncertain one and depending on the caprice of the atmosphere.

The desiccation of the air used in blast furnaces to such extent as to cause a practical elimination of the moisture, or its reduction to a small quantity, and maintaining it uniform, must of necessity contribute in a very marked degree toward the attainment of uniformity in the furnace operations, and the advantages from desiccation can be appreciated only after due consideration is given to the volume of air that is consumed per minute and the large amount of moisture which it contains. Managers of blast furnaces are familiar with the chilling effects produced in the hearth by a tuyere that is leaking, which immediately results in a deterioration in the grade of the iron, and yet the quantity of water ordinarily entering the furnace under these conditions is not greatly in excess of the quantity carried in, like a steady stream, by the atmosphere during a period of the average humid conditions prevailing in the summer season in this country.

It has been deemed preferable in this communication to express the quantity of moisture contained in the atmosphere as grains of water per cubic foot of air, inasmuch as the quantity of air blown into the blast furnaces is expressed in cubic feet. With air containing 1 grain of water per cubic foot there is passed into the furnace, for each 1000 cubic feet used per minute, practically 1 gallon of water per hour. The furnaces of average size in the Pittsburgh district consume about 40,000 cubic feet of air per minute, which would pass into the furnace 40 gallons of water per hour for each grain of moisture contained in a cubic foot of air. The quantity of moisture in the air, taken from daily readings by the observer of the United States Weather Bureau at Pittsburgh, is set forth in Table I.

* Read at the New York meeting of the Iron and Steel Institute, October 26.

Table I.

	Average temperature.	Grains of water per cubic foot of air.	Gallons of water entering per hour into a furnace using 40,000 cubic feet air per minute.
January	37	2.18	87.2
February	31.7	1.83	73.2
March	47	2.4	136
April	51	3.0	120
May	61.6	4.8	192
June	71.6	5.94	237.6
July	76.2	5.6	224
August	73.6	5.16	206.4
September	70.4	5.68	227.2
October	56.4	4.0	160
November	40.4	2.35	94
December	36.6	2.25	90

The above exhibit, like all records made by the Weather Bureau, is from observations taken on the top of a high building, and does not correctly indicate the condition of the atmosphere at the furnaces where the air is used. In fact, at one of the steel works in Pittsburgh observations made simultaneously at three separate stations showed quite a little variation in moisture. For the purpose of comparison with observations of the Weather Bureau there is shown in Table II the average monthly content of moisture in the air at the furnaces, the observations being made at 9 a.m.

Table II.

	Grains of water per cubic foot of air.
January	2.8
February	2.7
March	3.1
April	3.3
May	4.7
June	7.3
July	7.0
August	7.1
September	5.4
October	3.2
November	3.3
December	3.0

NOTE.—All tons are gross tons of 2240 pounds, and all temperatures are Fahrenheit.

The variations in moisture from month to month set forth clearly the conditions as to atmosphere with which blast furnaces in this country have to contend. If these conditions were uniform throughout the whole month it would not be a difficult problem to deal with, but, unfortunately, they are not uniform, and it is instructive to note the changes which occur from day to day in the same month. In Table III is shown a record worked out from data furnished by the Pittsburgh Weather Bureau. These observations represent a different period from that shown in Table I; they were taken at 8 a.m. and 8 p.m., and show the grains of water per cubic foot of air at the time observed for the months of January and July.

Table III.

	January. Grains of water.		July. Grains of water.	
Day.	8 a.m.	8 p.m.	8 a.m.	8 p.m.
1	1.96	3.06	7.24	7.48
2	2.55	3.66	8.23	7.98
3	2.46	3.80	8.50	7.48
4	2.07	2.27	8.50	7.48
5	1.81	1.12	8.46	7.72
6	0.99	1.12	6 50	8.24
7	1.16	1.67	8.78	7.47
8	1.49	1.88	7.98	7.24
9	1.96	2.19	6.78	5.94
10	1.81	1.88	7.48	6.35
11	1.74	1.55	7.98	7.48
12	1.55	1.07	6.73	6.35
13	0.99	1.55	5.94	4.84
14	1.61	1.81	5.55	5.74
15	1.67	1.96	5.74	5.19
16	2.04	2.27	6.35	6.35
17	2.45	3.29	7.72	7.98
18	1.81	1.32	7.24	7.24
19	1.12	1.16	8.24	7.48
20	1.43	2.11	7.48	7.24
21	2.11	1.88	7.72	7.38
22	1.88	1.88	6.78	5.74
23	0.91	1.17	7.43	6.35
24	0.90	2.11	6.56	6.11
25	0.69	1.83	6.05	7.74
26	0.61	0.99	7.72	7.32
27	0.56	0.88	7.98	7.48
28	0.72	0.70	6.56	5.74
29	0.76	0.80	6.14	5.01
30	0.95	1.12	5.74	6.35
31	0.70	1.41	6.56	5.19

It will be observed in the preceding table that, while the moisture in the atmosphere in the month of January is much less than in July, yet the percentage of variation is greater. The changes in the amount of moisture are great not only from day to day, but from hour to hour in the same day, and often they are very abrupt. Records were made at a furnace plant, located on the bank of a river, where the conditions exist for an increase in humidity as compared with higher ground; and to what extent the abrupt changes may have been caused by the presence of steam in the atmosphere—absorbed from spraying of the hot pig beds, the blowoff from boilers and exhaust from engines—or from a rainstorm, when the humidity decreases suddenly, it is impossible to say. How frequently has it happened in the experience of every furnace manager that the furnace has gradually or suddenly lost its hearth temperature and produced a grade of iron either undesirable or unmarketable, without any visible cause. Tuyeres are examined for leaks, the raw material in the stockyard is carefully inspected, and usually the coke is condemned. A more intimate acquaintance with the atmosphere would have provided a correct and ready reason, for the variations therein are not only many times greater than in the raw material, but a greater weight of it is used per ton of iron.

Plate 1.—Lines and Dimensions of Isabella Furnace No. 1.

It is true that the atmosphere has been recognized by many metallurgists as the cause of many and serious irregularities in blast furnace operations, but it is doubtful if its influence has been adequately recognized. Many writers on metallurgical subjects have considered the moisture in the atmosphere and calculated the absorption of heat necessary for its dissipation, and invariably underestimated, and have dismissed the subject with the conclusion that to extract the moisture the game is not worth the candle, or in a spirit of resignation accepted it—like storm and sunshine—as a condition beyond our control. This conclusion has no doubt been reached by a consideration alone of the quantity of fuel necessary to dissipate the moisture in the furnace hearth, based on observations of the humidity of the atmosphere taken outside the blowing engine room, and this quantity, while important, does not indicate a great saving in fuel. Of much greater importance is the variation in moisture from time to time and the margin of heat carried in the furnace to compensate for these variations, which margin is invariably large; and every furnace manager is aware of its existence from the way in which he is required to manipulate the hot blast temperatures and from the silicon in the metal, which is the thermometer of the hearth.

It has often been a matter of surprise that a greater saving of fuel per ton of iron was not obtained in the winter as compared with the summer season, as the records show a much less content of moisture in the atmosphere, the reason being that blowing engines at blast furnaces do not receive air of the dryness as shown in the exhibits above. In summer the windows and doors of the blowing engine room are wide open, and the supply of air, with reference to humidity, is practically that of the atmosphere; but in winter they are nearly or quite closed, and the entering air has mixed with it all of the steam that leaks from the engine and is contaminated therewith. Records taken over a number of years show that there is not a very great difference in the moisture in atmosphere between observations taken outdoors in summer and in the engine room in winter. In Table IV are monthly records showing a comparison beween winter and summer months, the observations having been taken indoors and outdoors respectively:

Table IV.

Winter. Month.	Grains of water per cubic foot air.	Summer. Month.	Grains of water per cubic foot air.
January	4.5	April	4.2
February	4.6	May	4.1
March	4.7	June	6.4
October	6.4	July	5.2
November	4.6	August	6.7
December	5.0	September	5.7

A comparison of the data given in Table IV with Table II would suggest that a great advantage could be derived by leading pipes from outdoors to the inlet valves of the air cylinder, and it certainly appears that a material advantage could be gained. So impressed was the writer with this conclusion that the blowing engines at a furnace under his direction were so equipped in the month of January, and continued to draw the supply of air from outdoors throughout the year. The excellent results expected in the winter season did not materialize, or, rather, were so slight as compared with a companion furnace not so equipped as to argue against any extension along that line. This experience suggested the conclusion that while the air in the engine room was higher in its content of moisture, through its admixture with steam, than the outside air, yet it was not subject to the same variations; and, further, that these variations, which were often sudden and great, were really the most troublesome feature and that nothing less than maintaining the atmosphere uniform with respect to humidity would prove of any material advantage. The saving in fuel through such uniformity could not be accurately set forth. The amount of fuel necessary for the decomposition of the moisture in the blast can be closely arrived at, but to what extent that which might be designated as the surplus of heat utilized for counteracting the variations in moisture could be diminished must of necessity be an approximation, as there existed no tangible data for estimating it. Nevertheless, the saving therein was deemed to be considerable.

It may reasonably be assumed that in order to determine the most feasible method and apparatus for extracting the moisture a wide field of experiment must be covered. Various schemes for absorbing the moisture were worked out and in turn abandoned, and refrigeration by means of anhydrous ammonia was chosen. After many preliminary experiments an insulated chamber containing coils of pipe, and of sufficient size to treat the air from a blowing cylinder 3 feet in diameter, was built. A small ice machine was installed to circulate the ammonia through the coils, and the air was admitted to the refrigerating chamber from an auxiliary chamber in which steam could be introduced at will, thus making it possible to treat, at any time, air containing the maximum amount of moisture with which it would be necessary to contend in the summer months. In this experimental plant air was treated under a variety of conditions for quite a period, and from the data obtained the equipment for a modern furnace was worked out.

The Plant at Isabella.

The Isabella Furnaces of the Carnegie Steel Company, located at Etna, Pa., a suburb of Pittsburgh, were selected as the plant at which to install the apparatus for applying the dry air blast.

The lines and dimensions of this furnace are shown in Plate I, and represent the usual construction of furnaces in the Pittsburgh district. The furnace is blown with 12 6-inch tuyeres, and is equipped with four hot blast stoves. Blast is supplied by three blowing engines having the following dimensions: Steam cylinder, 44 inches in diameter; air cylinder, 84 inches; stroke, 60 inches.

In Plate II there is shown in elevation the ammonia

compressors, condensers and the refrigerating chamber. This view of the refrigerating chamber shows it to be connected for the direct expansion of ammonia, but as the escape of ammonia gas through a broken pipe or leaking joint might imperil the life of any one in the chamber at the time, it was decided to adopt the brine system, and the pipe connections are as shown in Plates III and IV, representing the refrigerating chamber in end view and vertical section. The refrigerating chamber is lined on the inside with plates of compressed cork 2 inches thick.

The ammonia machines are of the compressor type, and were built by the York Mfg. Company, York, Pa. The dimensions are as follows: Diameter high pressure steam cylinder, 28½ inches; low pressure, 56 inches; compressor cylinder, 22½ inches; stroke, 36 inches. Two compressors were installed in order to have one in reserve at all times, as a furnace operating on uniformly dry air cannot be subjected to ordinary atmospheric conditions without serious results, and frequently on very humid days the assistance of a second engine might be required. Each compressor has a capacity of 225 tons ice melting effect.

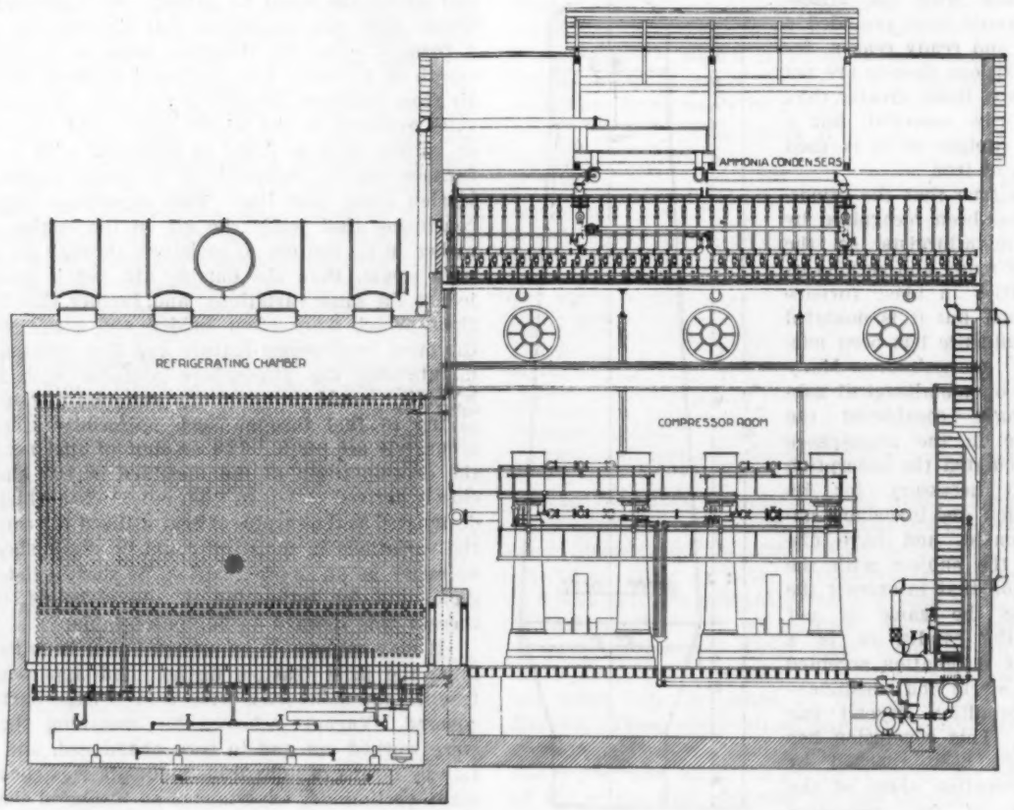


Plate II.—Elevation of Ammonia Compressors, Condensers and the Refrigerating Chamber.

Plate V shows the brine tank, in which are 20 coils of pipe of the dimensions shown in the diagram. The coils are covered with calcium chloride brine having a specific gravity of 1.21. The return brine from the refrigerating chamber flows into the top of the tank, is cooled by the ammonia expanding between the outer and inner pipes, withdrawn therefrom by a pump and forced back through the pipe marked "brine inlet" into the 2-inch, or inner, pipes, where it is cooled below the freezing point, and thence into the coils in the refrigerating chamber. The ammonia enters at the bottom of the pipes, thus traveling in the opposite direction from the brine, and by expanding between the 2-inch and 3-inch pipe cools the brine both in the tank and in the inner pipes. Forty thousand gallons of brine are required in the system.

In Plates III and IV is shown the arrangement of pipes in the refrigerating chamber. There are in each vertical line of coils 75 2-inch pipes 20 feet long, and in the chamber there are 60 vertical lines of coil, the whole representing 90,000 lineal feet of 2-inch pipe in the chamber. The pipes in each vertical coil are placed in staggered position to insure better contact with the air. The series of coils is divided into three sections and fed through a 4-inch header, and discharges into a 6-inch header, thence into a stand pipe, from which the brine flows to the brine tank, its feed being arranged to cause the brine to flow in a direction opposite to that of the air. As the space between the pipes would become gradually reduced through the accumulation of frost, which might diminish the efficiency of the blowing engine, a blower was installed to force air into the refrigerating chamber, and in order to secure a uniform distribution of air over the coils revolving electric fans (marked 1 and 2) were placed in the space underneath, so that all of the coils would frost alike. The entering air, according to its humidity, deposits the moisture in the form of water or frost on the lower pipes and as frost only on the upper pipes, and passes from the top of the chamber to the blowing engines at a temperature of freezing or below and with a practically uniform content of moisture. When the pipes become covered with frost the cold brine is shut off from several vertical lines of coil at a time, and through an auxiliary pump and line of pipe brine that has been heated in a tank with steam is forced through, and in a few minutes the frost is melted. Connection is then made with the cold brine system, and frost begins to deposit quickly. The frost which has been melted off the pipes collects in a trough in the basement floor, from which it flows into the supply tank for the condenser.

The dry blast plant is constructed throughout in the most substantial manner, for it is obvious that an apparatus treating such an important element of the process as the atmosphere could not be practically applied to a modern furnace in an experimental way, but must of necessity be as ample in capacity and as substantial in construction as any of the present day accessories of the furnace stack.

Results Obtained.

The dry blast plant was put in operation on August 11, 1904. The furnace was making a grade of iron suitable for the basic open hearth furnace, containing less than 1 per cent. silicon, with an ore mixture consisting of 50 per cent. Mesaba ore, the balance being soft hematites from Michigan. The mixture showed a yield by analysis of 53.5 per cent. iron. The coke used was shipped from two mines and contained on an average 10.5 and 12.5 per cent. of ash, respectively, and also varied considerably in ash. In order to obtain correct data from the use of the dry blast it was determined beforehand

that no changes in any particular were to be made in the operation of the furnace other than the introduction of dry air, and this has been rigidly adhered to. In the data following a comparison is made between the operations of the furnace using dry air after August 11 and those from August 1 to August 11, when the furnace was using the atmosphere under ordinary conditions. A comparison with the previous month would show a greater economy in coke, but since a change was made in the ore mixture in the latter part of July—which gave a lower coke consumption per ton of iron—a comparison of data when using dry air with that obtained in August prior to its use, and with the same ore mixture, would more accurately show the benefits derived. The burden on the furnace from August 1 to 11, inclusive, was as follows:

	Pounds.
Coke	10,200
Ore	20,000
Stone	5,000

On August 11 5 per cent. increase in burden was put on the furnace and later in the day 33 per cent. of dry blast

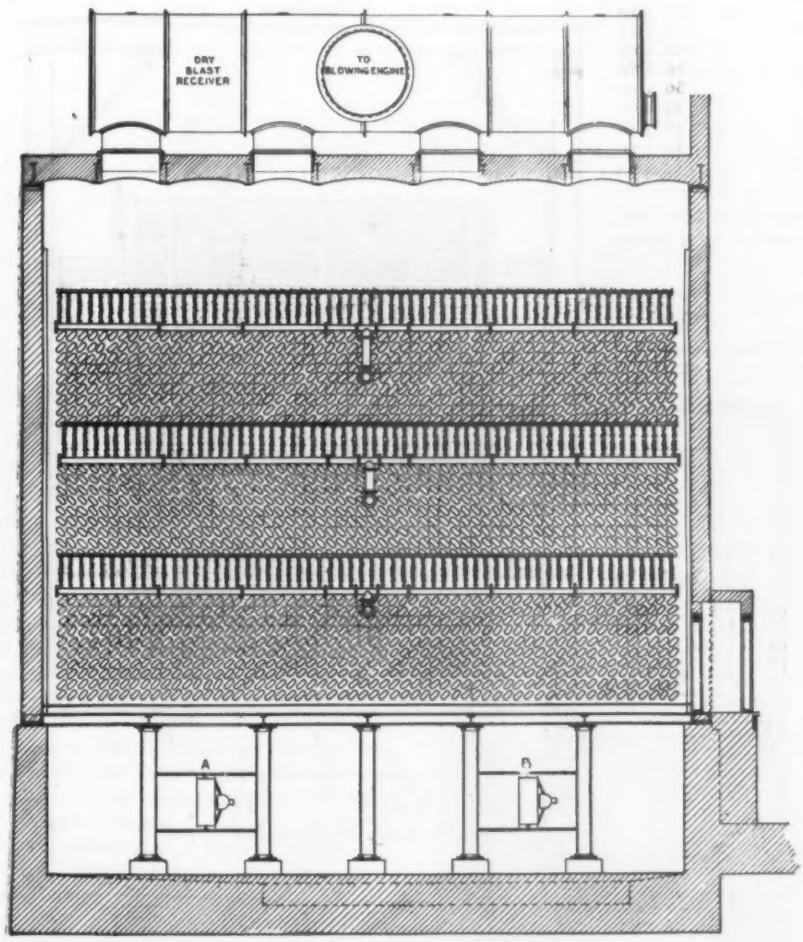


Plate III.—End View of the Refrigerating Chamber, Showing Pipe Connections.

was used. As soon as this small quantity was introduced its effect was noticeable by a brightening of the tuyeres and an increasing temperature of the cinder. After this change in burden had come to work, and the condition of the furnace showing, if anything, more satisfactory, an additional 5 per cent. of burden was put on with confidence, feeling assured that an increased use of dry blast would offset the increased duty on the furnace. From this period on the burden and volume of dry blast were increased more slowly until, on August 25, the furnace, using dry blast entirely, had the following burden at work:

	Pounds.
Coke	10,200
Ore	24,000
Stone	6,000

thus in two weeks obtaining an increase in burden of 20 per cent. The record of the furnace from August 1 to 11, prior to the use of the dry blast, and from August 25 to September 9, inclusive, using all dry blast, is shown in Table V:

Table V.

Without Dry Blast.			With Dry Blast.		
	Product. Tons.	Coke consumption. Pounds.		Product. Tons.	Coke consumption. Pounds.
August 1	360	2,210	August 25	462	1,766
August 2	367	2,112	August 26	441	1,850
August 3	372	2,084	August 27	477	1,668
August 4	373	2,133	August 28	516	1,462
August 5	386	2,008	August 29	405	1,763
August 6	340	2,280	August 30	441	1,804
August 7	347	2,116	August 31	462	1,722
August 8	360	2,012	September 1	472	1,729
August 9	378	2,114	September 2	472	1,642
August 10	352	2,318	September 3	458	1,648
August 11	306	2,266	September 4	421	1,841
			September 5	450	1,813
Average	358	2,147	September 6	400	1,683
			September 7	400	1,734
			September 8	397	1,952
			September 9	472	1,642
			Average	447	1,726

In Plate X there is graphically set forth the record of furnace operations from August 1 to September 9, inclusive. This shows the increase in output and reduction in coke consumption corresponding to the increase in burden. There is also shown the varying conditions of humidity from day to day, which represent the average humidity for each 12-hour period, and the change in humidity after being treated in the dry blast apparatus. While the reduction in moisture and its increase in uniformity is considerable, it should not be lost sight of that this represents the beginning of operations, and there was still much to be learned with respect to manipulation of the dry blast plant.

The effect of reducing and making more uniform the moisture in the blast was clearly shown when, during a period of excessive humidity extending over three days, a neighboring furnace charged during this period an extra quantity of coke and increased the quantity each day in order to maintain the grade of iron, while the Isabella Furnace, operating on dry blast, was in no wise affected.

On September 10 it was found necessary to make some repairs to the compressors and to make connections to a new brine header for thawing off the coils, and the burden was lightened accordingly. After these repairs had been made the burden was again increased, and from September 17 to 30, inclusive, the furnace showed an average daily output of 452 tons, with a coke consumption of 1729 pounds per ton of iron.

In order to show what changes have been made in the atmosphere by passing it through a refrigerating chamber the following daily records of operations, as set forth in Table VI, will give a very clear idea:

During a period of 13 days the average moisture in the atmosphere was 5.66 grains per cubic foot and in the dry air 1.75 grains. Sixty-nine pounds of water were removed from the blast per ton of iron produced, which represents an average of 23,192 pounds (equivalent to 2784 gallons) for the 24 hours. This weight was calculated from the volume of air blown into the furnace as shown by piston displacement. For four days during the above period the water caught in the tank underneath the refrigerating chamber amounted to an average of 21,561

pounds (equivalent to 2588 gallons) for the 24 hours, which is as close an agreement as could be expected, considering that the figures do not represent the same number of days, and the difficulty in accurately determining the volume and humidity of the air supplied in a given period. It is found sufficient in practice to thaw the frost off the pipes every three days. The coils are divided, for the purpose of thawing off, into three sections, each representing the same number of coils, and a section is thawed each day, and in this way the work of refrigeration is not interfered with.

Table VI.—Refrigerating Chamber

	Temperature.		Grains of water per cubic foot air.		Temperature.		Grains of water per cubic foot air.		Temperature.		Grains of water per cubic foot air.	
Time.	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.	Inlet.	Outlet.
6 a.m.	68	21	5.19	1.33	70	22	6.35	1.70	77	22	3.94	1.48
7 a.m.	68	20	5.02	1.24	71	22	6.78	1.77	..	..	4.08	1.29
8 a.m.	70	20	5.56	1.55	69	22	6.67	1.62	..	..	4.22	1.42
9 a.m.	73	20	5.37	1.46	73	22	6.78	1.70	71	25	4.85	1.36
10 a.m.	74	20	5.47	1.81	74	22	6.78	1.70	..	..	5.02	1.48
11 a.m.	77	20	5.56	1.53	77	23	6.67	1.70	..	..	5.19	1.55
12 m.	77	21	6.04	1.53	81	23	6.56	1.62	81	28	5.37	1.70
1 p.m.	80	21	6.04	1.42	78	24	6.56	1.70	..	..	4.85	1.62
2 p.m.	81	22	6.14	1.60	82	25	6.56	1.90	..	..	4.85	1.62
3 p.m.	81	23	5.74	1.60	81	24	6.19	1.74	84	29	5.02	1.70
4 p.m.	82	23	5.74	1.55	81	24	6.19	1.42	..	..	4.68	1.48
5 p.m.	82	22	6.04	1.62	80	24	6.14	1.48	..	..	4.85	1.60
6 p.m.	81	23	5.94	1.55	75	24	5.56	1.55	78	29	5.37	1.77
7 p.m.	80	23	5.74	1.62	72	24	5.94	1.70	..	..	5.37	1.62
8 p.m.	79	24	5.94	1.55	70	23	5.19	1.62	..	..	5.56	1.70
9 p.m.	73	23	7.01	1.85	69	22	5.19	1.42	72	29	5.74	1.70
10 p.m.	73	22	6.78	1.70	68	21	5.19	1.55	..	..	5.74	1.77
11 p.m.	73	23	6.78	1.70	66	20	3.94	1.77	..	..	5.74	1.62
12 ngt.	73	23	7.01	1.70	62	20	3.54	1.62	66	28	5.56	1.70
1 a.m.	73	23	6.78	1.70	59	18	3.41	1.42	..	..	4.85	1.70
2 a.m.	74	23	7.01	1.70	57	17	3.54	1.13	..	..	5.37	1.70
3 a.m.	73	23	6.78	1.70	56	16	3.18	1.13	64	27	5.19	1.48
4 a.m.	73	23	6.78	1.48	56	16	3.18	0.99	..	..	5.19	1.36
5 a.m.	73	23	6.78	1.48	53	14	2.85	1.06	..	..	4.85	1.48

As the dry blast was supplied to the furnace it became necessary to reduce the revolutions of the blowing engines, since the air supplied to the engines was lower in temperature than the natural atmosphere and contained more oxygen per cubic foot, and the tendency of the furnace was to drive too fast. Before applying the dry blast the engines were running at 114 revolutions and supplying 40,000 cubic feet of air per minute; the revolutions were gradually reduced to 96, thereby reducing the volume of blast over 6000 cubic feet per minute and increasing the efficiency of the engines by 14 per cent. With dried blast 96 revolutions per minute of the blowing engines burned nearly 1 per cent. more coke and produced 89 tons more pig iron in 24 hours than 114 revolutions on natural air. The reduction in the revolutions resulted in a gain of 150 degrees in temperature of the blast, which even with this increase, through lack of area in the waste gas ports of the stove, did not average above 870 degrees.

The average analysis of the gas for 10 days prior to the introduction of the dry blast showed CO, 22.3 per cent.; CO_2, 13 per cent., with an average temperature of 538 degrees. Later, with dry blast used entirely, the average analysis was CO, 19.9 per cent.; CO_2, 16 per cent, with an average temperature of 376 degrees. This reduction in temperature of 162 degrees is a necessary consequence of the greater concentration of heat in the hearth by the dry blast combustion and the greater weight of burden heated by the gas, and represents an important saving of heat in the furnace.

The use of dry blast has resulted in economies in several other directions. With the use of Mesaba ore, which is very fine in structure, the waste of ore dust through the escaping gases is quite large, and at many furnaces the waste in ore has become quite burdensome. The waste at the Isabella Furnace before dry blast was used amounted to 5 per cent. of the ore charged; this has been reduced, through the greater uniformity in the furnace working, to less than 1 per cent.

The saving in coke consumption reduces the phosphorus in the metal, and this, in making Bessemer iron, permits the use of high phosphorus ores. As the Isabella Furnace was making basic iron, it was of advantage to keep the silicon as low as possible, provided the sulphur was kept low, and the absence of irregularities in the furnace operations resulting from the dry blast permitted the keeping of the silicon at a lower range without increasing the sulphur. It has been generally observed by furnace managers that when the silicon is lowered through increased humidity in the atmosphere, a leaking tuyere, or through other causes, the sulphur is rapidly increased; but it has been found in using the dry blast that when the hearth temperature was suddenly lowered, principally from accretions on the bosh reaching the hearth, the sulphur did not increase, and in this respect the furnace has shown a remarkable uniformity in composition of the metal produced.

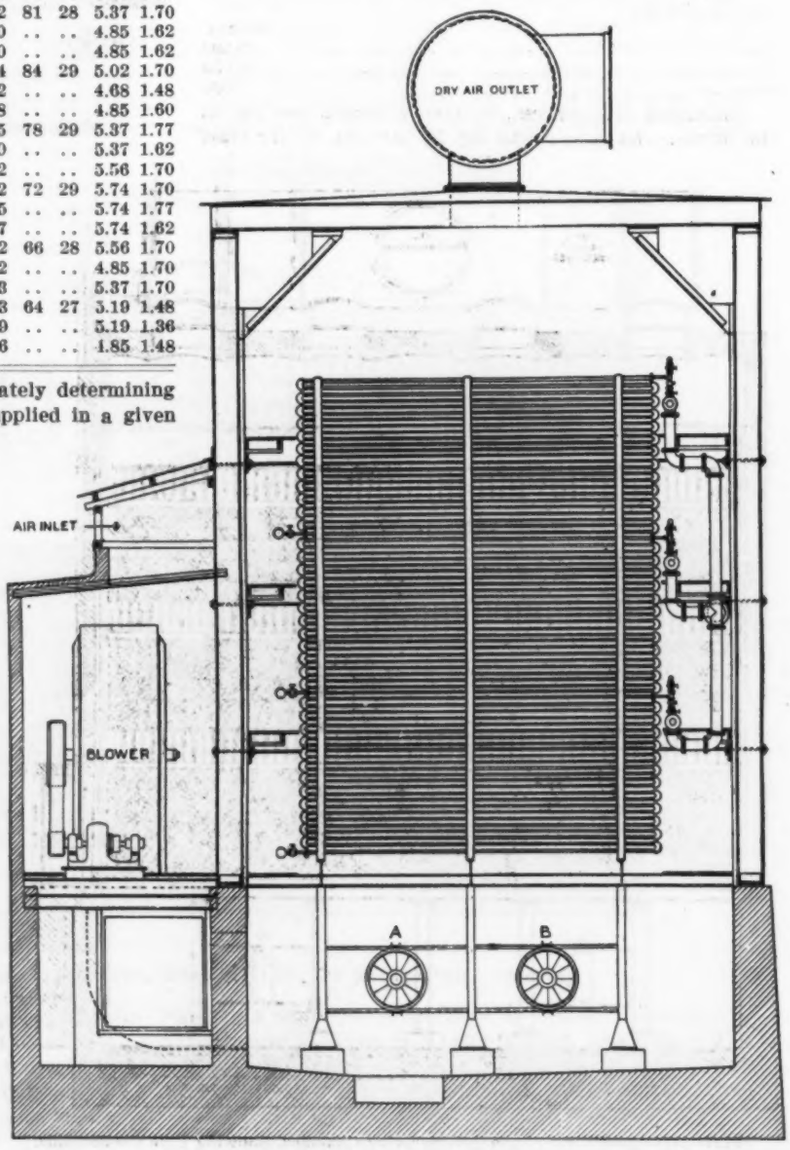


Plate IV.—Vertical Section of the Refrigerating Chamber, Showing Pipe Connections.

Mention has been made of the saving effected in the blowing engines through a reduction in the number of the revolutions, and this saving has an important bearing on the expenditure for power in operating the machines

in the dry blast plant. Prior to the use of the dry blast plant the blowing engines were indicated and the average horse-power developed by each engine was 900 indicated horse-power. From the cards taken when the furnace was supplied with dry blast the average indicated horse-power was 671, a difference of 229 horse-power per engine, which aggregates 687 indicated horse-power for the three engines. Cards were also taken from the ammonia compressors, the compression and back pressure being kept as nearly as possible to the best working condition. When running at 45 revolutions, which would probably represent the average for the year, each engine developed 230 indicated horse-power, or 460 horse-power for the two engines; the fans, together with the brine and water pumps, are well covered by allowing for them 75 horse-power, making a total of 535 horse-power. Comparing this with the power saved in the blowing engine room, there appears an excess above that required for operating the dry blast plant. These figures, however, may not represent accurately the difference in power consumption, as the blowing engines were indicated at different times and the first test was taken with a blast pressure on the furnace of 17 pounds, while the test made with the dry blast was 15 pounds, and the figures given above might require some modification, as the effect of dry blast on blast pressure is not yet fully determined. The increase of uniformity in the working of the furnace which is obtained through the dry blast would result in a decrease in the blast pressure, and it would appear in any event that the saving in power consumption in the blowing engine room would nearly or quite compensate for the requirements at the dry blast plant.

The application of the dry blast to the blast furnace has shown, in addition to the economies effected, that the furnace can be operated with precision; it works with greater regularity, and in consequence the product is uniform with respect to grade and composition, which makes the dry blast of particular value in the making of foundry iron, which is marketed by grade. An increase or decrease in blast temperature has a definite effect and can be relied on to accomplish the desired result.

The dry blast plant since it was started on August 11 has been in regular operation. It started without a hitch and no difficulties have developed in any direction.

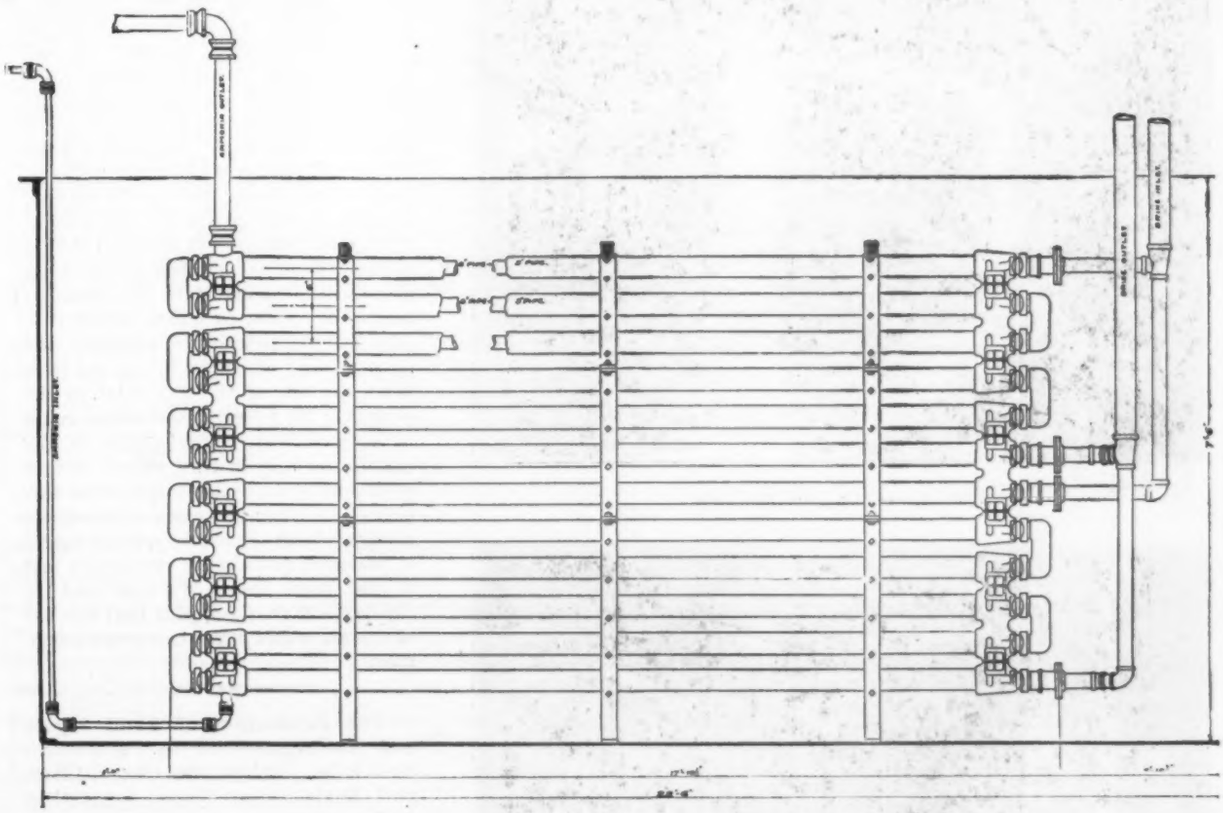


Plate V.—The Brine Coil.

Plate VI.—Ammonia Compressors.

Some modification in construction has been indicated as the result of the operation of the plant which would further reduce the moisture and add to its uniformity, but

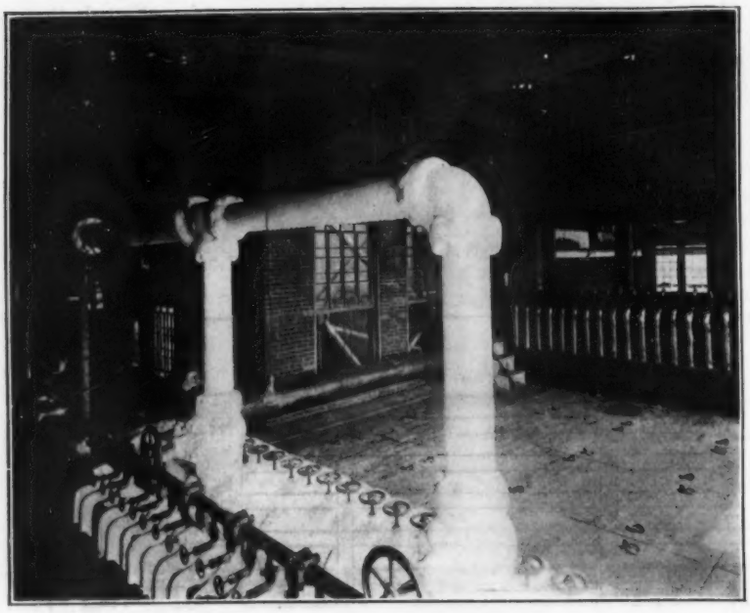


Plate VII.—Brine Cooling Tank.

Plate VIII.—Circulating Fans Under Refrigerator Coils.

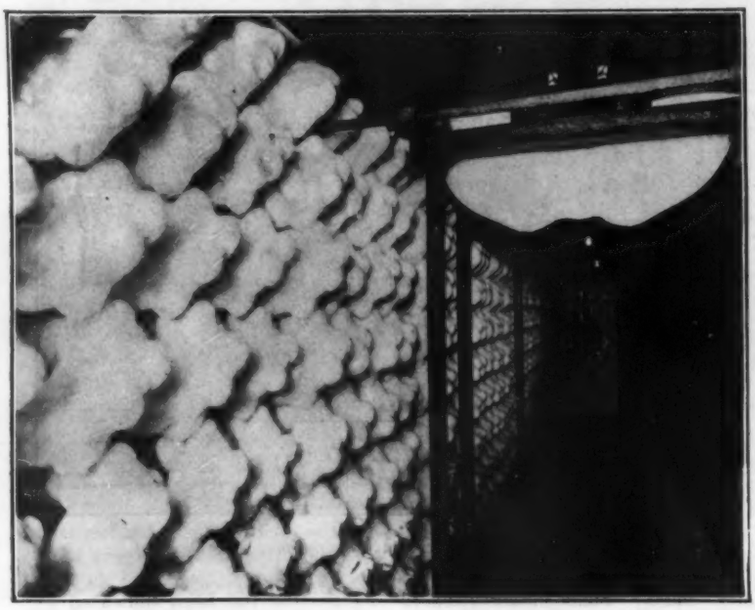


Plate IX.—Refrigerating Chamber, Showing Frosted Ends of Coils.

so far the changes suggested have been slight.

While the application of the dry blast to the blast furnace has effected various economies and produced a more uniform metal, its further application to the Bessemer converter would no doubt result in great benefit, since air is used in large quantities and the varying humidity affects the temperature of the charge and in consequence the quality of the steel. The metal from the metal mixer is remarkably uniform, and the additional uniformity secured through the use of dry air would be of further advantage. It happens that a higher silicon is required in the summer months to maintain the temperature of the blow, in which period it is also more expensive to maintain the right amount of silicon in the pig iron. With the use of the dry blast in the converter the proper temperature could be secured with lower silicon in the metal, and this in turn would further reduce the coke consumption at the furnaces. In other processes where air is used in large quantities—particularly in smelters and copper converters and in the open hearth furnace and in cupolas— it would appear that the use of dry air would effect important economies.

The Production of Solid Ingots and Castings.—Geo. G. Blackwell, Sons & Co., Limited, the Albany, Liverpool, England, have issued a pamphlet calling attention to the results produced by the use of their S. A. M. alloy for the purpose of obviating blowholes, flaws and pipes in ingots and castings. To prevent blowholes and produce sound ingots and castings it is necessary to add to the steel or iron a combination of metals which will combine with all the occluded gases. Such a combination, the pamphlet states, is found in the S. A. M. alloy, which consists of several metals, such as aluminum and manganese, having a greater chemical affinity for oxygen than the metals to be cast, and one or more electro-negative nonmetallic elements or metalloids, such as silicon or boron. The elements of this alloy are converted by taking up the oxygen from the casting into single, double or multiple silicates, borates, &c., which produce a readily fusible slag. It is stated that by the use of this alloy the slag is quickly formed, rising in the form of globules upward through the liquid and much heavier material of the casting, which renders the latter free from blowholes. Extracts are given from letters received from large English and Scotch steel works, American steel casting works and English and American iron founders testifying to the satisfactory results accomplished from the use of this alloy.

A Danish scientist, C. F. Hilkier, has invented an automatic fire alarm which acts only when a sudden wave of heat is generated in an inclosed space, and is not influenced by an evenly created high temperature such as that caused by intense summer heat or the

artificial heat used for warming buildings or in drying rooms and other places where a somewhat abnormal temperature is maintained. It consists of a small glass tube bent into a U shape, with closed ends. It is half filled with mercury and the upper part contains a highly volatile liquid, such as sulphuric ether. One end of the tube is inclosed with some non-heat conducting material, so that a sudden rise in temperature affects only the exposed end. A wire is fused into both ends of the glass, so that it reaches the mercury when the latter is in its normal position and a continuous electric current passes through. But when a sudden wave of heat reaches the instrument it affects only the unprotected end of the tube and the volatile liquid expands instantly, forcing the mercury into the covered end, thus severing the electric connection and setting in motion an alarm. The apparatus also indicates a break in the electric current caused by the batteries running down or otherwise, so that there may always be assurance that the device is in working order. It is said to sound the alarm when a small fire of shavings is started in its immediate vicinity.

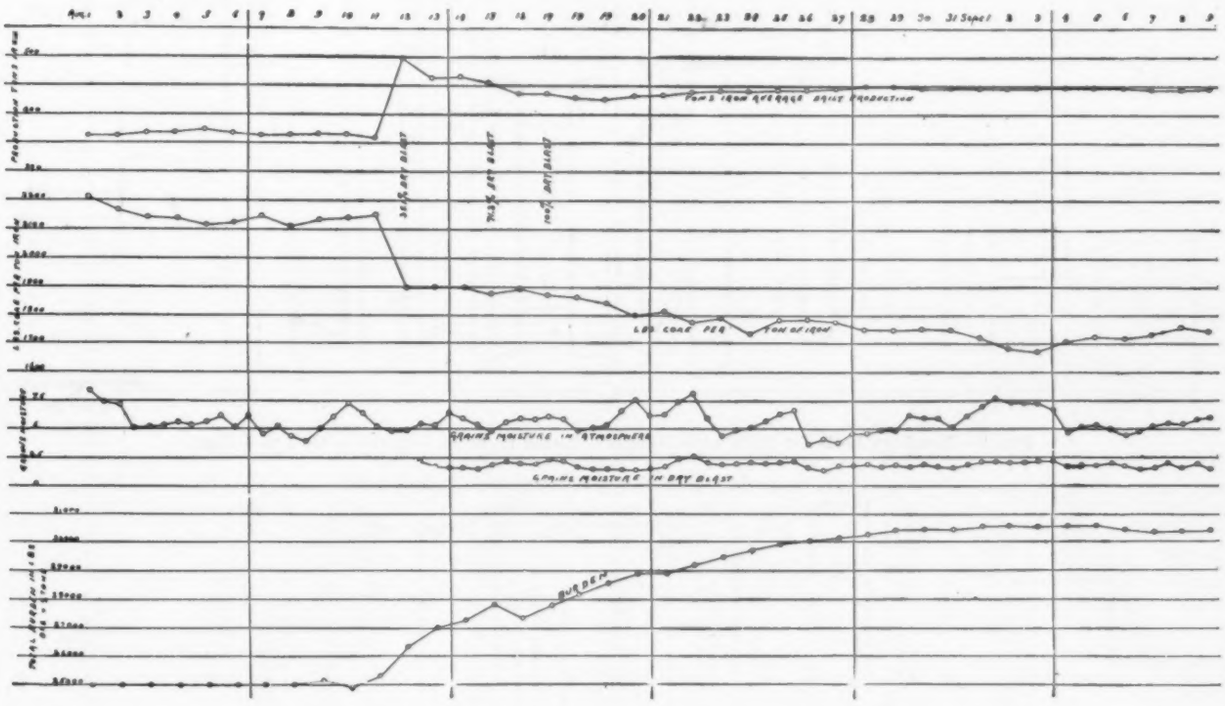


Plate X.—Record of Furnace Operations from August 1 to September 9, Inclusive.

Mexican Railroad and Industrial Notes.

DURANGO, October 19, 1904.—Tomás E. Ramos has obtained a concession from the Government to construct a railroad, about 25 km. in length, from Hunuchá to Sisal, in the State of Yucatan. This road must be completed within five years.

Richard Honey, one of the pioneers in the iron manufacturing industry in Mexico, has obtained a concession to construct a branch from Tetepango, on the Mexican Central's Tula-Pachucca line, to Ixmiquelpan and to Zimapan, in the State of Hidalgo. This branch line will run through a famous old mining district and be of great benefit to Mr. Honey, who operates extensive iron ore mines not far distant from the proposed route. The contract for the construction work has been let to John Phillips.

A Mexican company, whose name is not given, has been granted a concession covering a line from Tultenango to Toluca, the capital of the State of Mexico. At least 10 km. must be completed in the first three years, and 3 km. each year following until the line is finished.

A syndicate of United States capitalists, among whom are W. H. Salisbury, J. H. Wrenn and D. O. Arnold, purpose constructing two important lines in the State of Mexico whose joint length will be about 250 km. Surveys are now being made. One will go by way of Tenango, Tenancingo, and near Zacualpam, close to the State line of Morelos. The other will run from Toluca through Sultepec and Temascaltepec mining districts, passing Texcaltitlan, and continuing west to Tejupilco and the State line of Morelos.

A concession has been granted to the Pan-American Railway Company to build a line from Tonola to Tuxtla Guiterrez and Chiapa de Corzo, in the State of Chiapas.

Industrial Notes.

The Mexican Government has ordered from the shipyards of Sexti Poniente, Italy, a transport for the navy, to be delivered in the coming year. The armament will be supplied by the Creusot Works of France.

The Buffalo Forge Company, Buffalo, N. Y., has opened an office in the capital, in charge of A. F. Delbert.

Statistics covering the foreign trade of Mexico during the fiscal year 1903-1904 are published, from which it appears that the gold value of the imports was $78,308,442.60, compared with $75,904,807.58 in the fiscal year preceding. Machinery and apparatus valued at $10,622,475.64 are included in the last fiscal year's total. Exports for the same year aggregated $210,276,374.46, against $207,377,793.17 in the fiscal year 1902-1903.

Application has been made by Samson Lang for a concession to use for motive power 78,000 liters of water per second from the Amacusac River, in the State of Morelos.

A large hydraulic plant will be constructed by Ramon F. Lujan and Julio Muller on the Rio del Valle, Chihuahua, where they own an extensive ranch. Power will be generated for irrigation and to supply the cities of Parral and Jimenez.

Lorenzo L. Jones and Luis MacGregor, both Mexican citizens, ask for a concession to utilize the waters of Lake Patzcuaro, in the State of Michoacan, for power and irrigation purposes. J. J. D.

The Falkenau-Sinclair Company, Philadelphia, Pa., at a recent meeting of its stockholders decided to liquidate its business. Outstanding accounts have been paid and the plant will be operated only long enough to finish contracts under way. The stock on hand will be sold. The company is prepared to negotiate for the sale of its business and property either as a whole or by departments. A. Falkenau was appointed manager of the liquidation.

The Rolling of Sections in Iron and Steel.—III.*

BY ADOLPH S. WHILE, HUGHESOFFKA, RUSSIA.

The Rolling of Rails.

As the area of the cross section of a rail increases, so proportionately the work upon it decreases; consequently the internal structure as compared to that of a lighter rail section rolled from the same size of ingot would not be parallel, for as the temperature decreases by reason of the greater reduction of area the effect of applied draft increases. Particularly is this the case in the finishing passes. This principle has become so universally recognized that orders sometimes include in the specifications stipulations that the section must be rolled from ingots of an area of at least 20 times that of the finished product.

The natural solution of this problem—namely, to provide an ingot of proportionately increased size—is restricted by the capacity of the plant, power equipment, mechanical appliances, &c. As the difficulties encountered to keep fully abreast with requirements become accentuated, in accordance with the nature of the complex demands, a multiplicity of mechanical devices has been perfected the benefits from which in skillful manipulation for dispatch of work cannot be overestimated. A considerable saving of time and labor is thereby effected, contributing materially to what some one has aptly described as "the end of all endeavor, economy of production." This has proved a very attractive field for enterprise and one in which America leads the way.

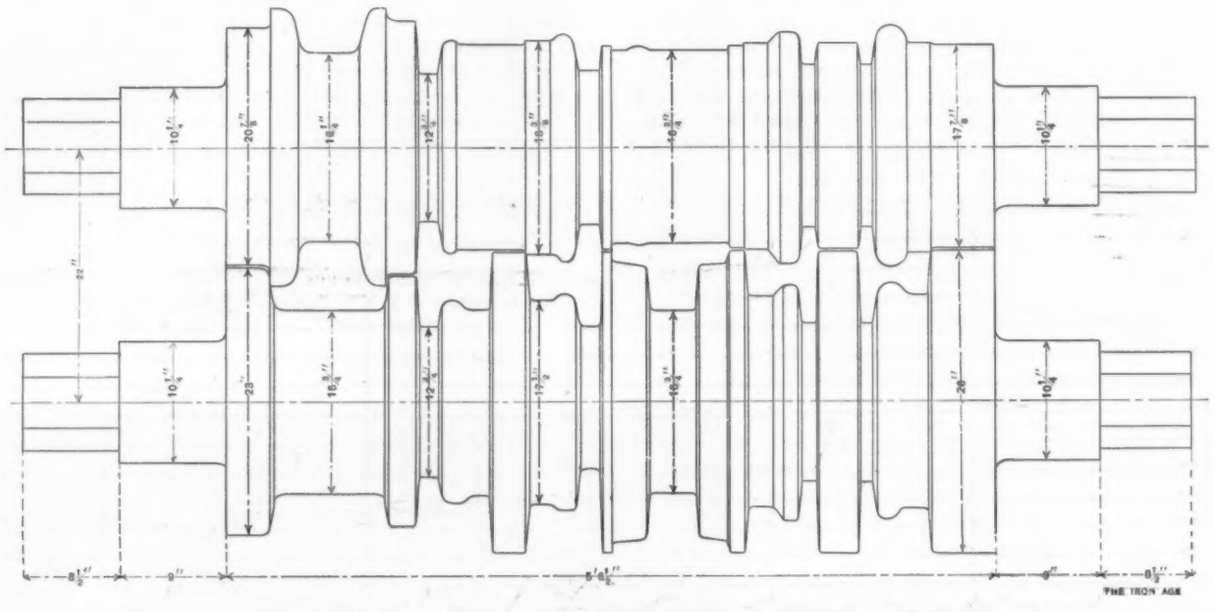


Fig. 1.—Roughing Rolls for Rails with Flanges 8 Inches in Width.—Scale, ¾ Inch to 1 Foot.

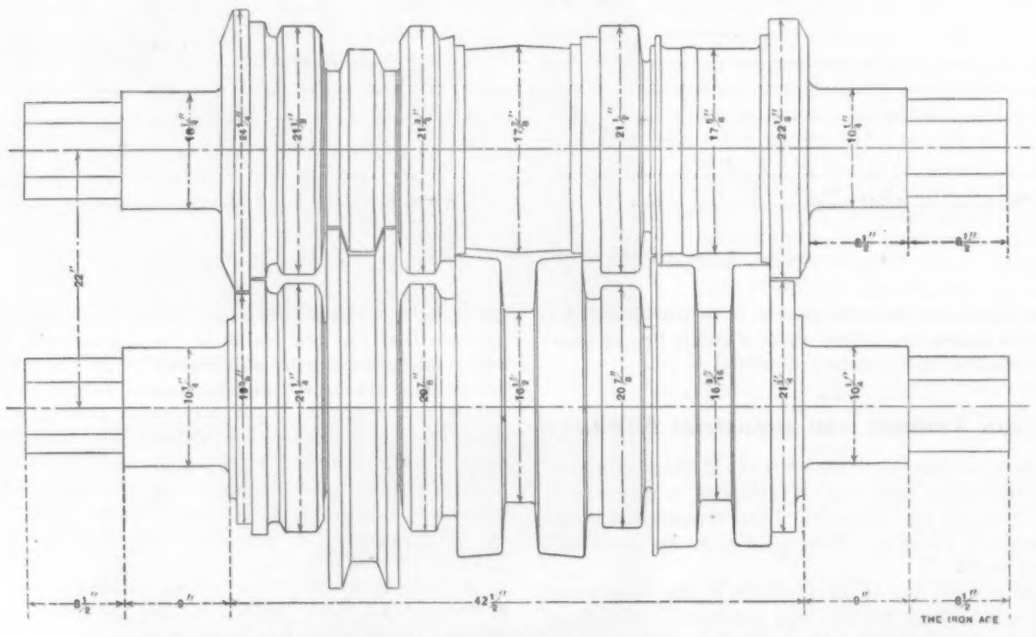


Fig. 2.—Finishing Rolls for Rails with Flanges 8 Inches in Width.—Scale, ¾ Inch to 1 Foot.

The adoption of the most desirable methods of rolling has been greatly facilitated by the aid of these mechanical appliances, many problems being solved according to their efficiency—namely, size of bloom possible to be manipulated for the heavier sections, and the subsequent direct treatment achieved through their agency. Should the process of rolling be retarded, and the temperature fall below the critical point of advantageous manipulation, the disproportionate ductility engendered would result in serious defects. The results which have actually accrued through the medium of these accessories by furthering a perfect continuity of action is a standard of accuracy and reliability hitherto unattainable.

It is apparent from the form of a rail section that unequal results in tenacity and elongation would invariably

* The first part of this article was published in *The Iron Age*, October 13, page 12, and the second part October 20, page 16.

be obtained from the head, web and flange, respectively. The comparison of the inequality of structure and the results obtained, as being influenced by the methods employed in rolling, in overcoming in so far as is within the limit of possible accomplishment this inequality, or as occasion may demand, obtaining the maximum results of quality of structure in a specified portion of a section, is a study that should be undertaken with a thoroughness equal to that with which any scientific researches are undertaken.

The methods employed must consist primarily in seizing the earliest opportunity for direct reduction as far as is consistent for the formation of the section; for in inverse ratio the effect of applied work on a section at a high temperature causes less change in its crystallization. In the succeeding passes the physical qualities derived from work become more apparent, especially in the flanges, and the strength of the bar is greatly increased.

A variety of methods for rolling flange rails have been developed as being peculiarly adapted to local conditions; there are, however, certain principles applicable to all. The final slabbing to obtain the necessary width of flange should be left to as late a stage in the process of rolling as is practicable, as after the slabbing the flanges cool very rapidly. In all cases the width of the flange before slabbing should not be less than the width in the first pass after slabbing.

The flange should be invariably longer and thinner on the open side of the pass to admit of easy entrance to the succeeding closed side of the pass; the first point of contact of the metal with the rolls being alternated in each succeeding pass. The intervening closed side of the pass should be slightly beveled, and the length of flange coextensive with that in the succeeding open side of the pass. The thicker the flange, naturally, the easier to roll, but it should have a proportionate amount of draft as it increases in thickness and width.

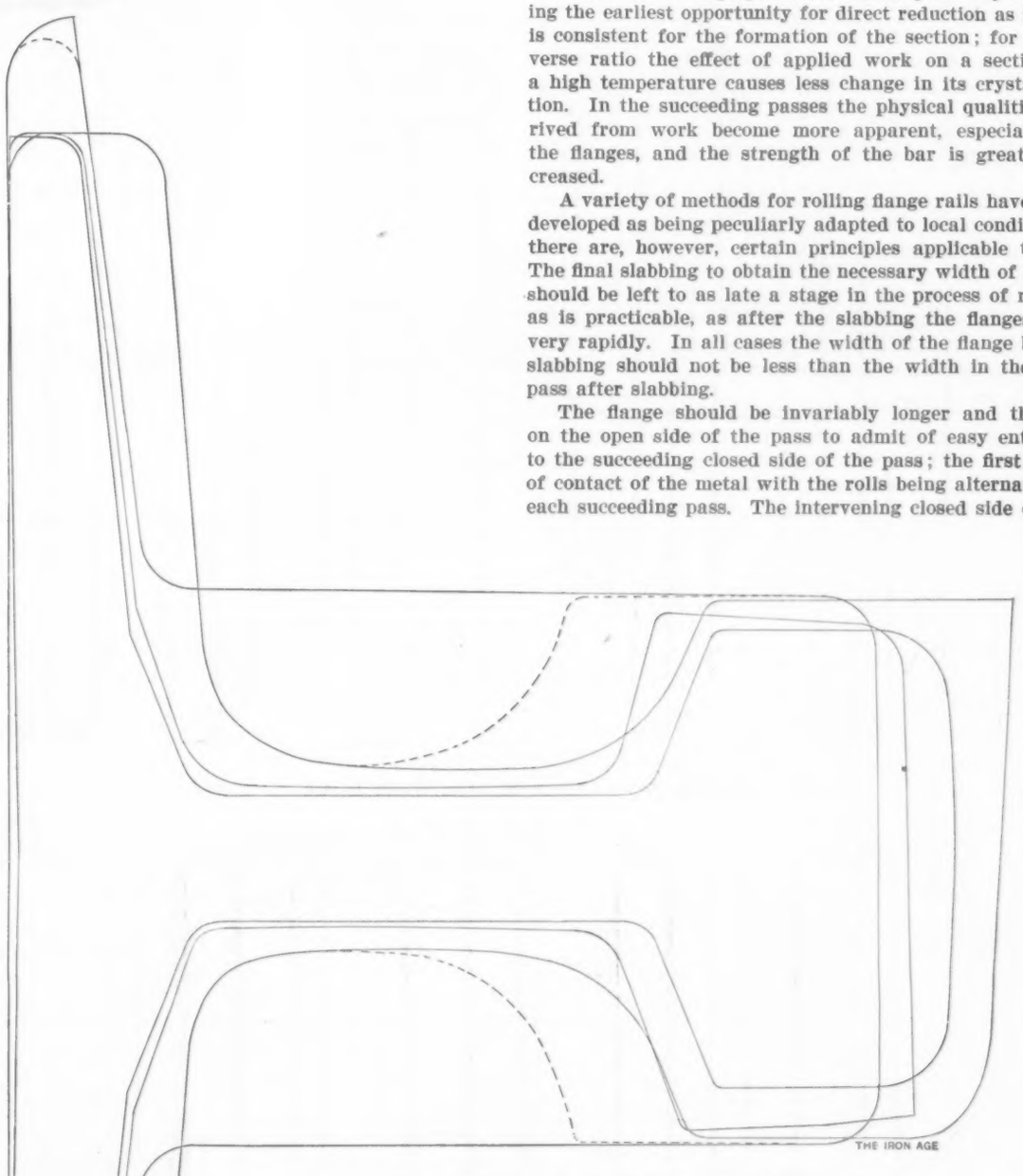


Fig. 2a.—Full Sized Section of the Four Finishing Passes.

The amount of draft on the head of the rail in the last pass is regulated by its shape and the provision made for the spreading of the metal laterally. This pass is generally divided in the center of the head of the rail, both sides being equivalent to a closed pass. Should the top of the head be even slightly convex, it greatly facilitates acquiring an accurate section, as the additional side pressure thereby conceded restrains the lateral extension of the metal and fills more completely the pass on the under side of the head, familiarly termed the shoulder. In the case of a flat-headed section this portion has a tendency to run bare, as the draft must be applied vertically.

Figs. 1 and 2 indicate the roughing and finishing rolls for rolling rails with flanges of 8 inches in width.

The unpromising character of this section under available conditions—namely, the exceptional width of flange as being required to be rolled in a 22-inch train—has proved to be in no way prejudicial to satisfactory results.

It will be noted that, in the pass preceding that in which the bar is slabbed to obtain the requisite width of flange, the division is effected between the head and the sole. This regulation has often been the subject of inquiry, as also that of the draft being applied exclusively on the flanges. So universal is this custom among roll designers that a Russian engineer, M. Udovenko, has patented a system for rolling flange rails, the guiding principle of which is that the bar must never be submitted to the action of the grooves compressing the rail in its hight and expanding the sole after the formation by the groove dividing the rail into head and sole, or substantially in this, that the grooves serving for formation of the hight and sole of the rail are never applied after the groove dividing the bar into head and sole.

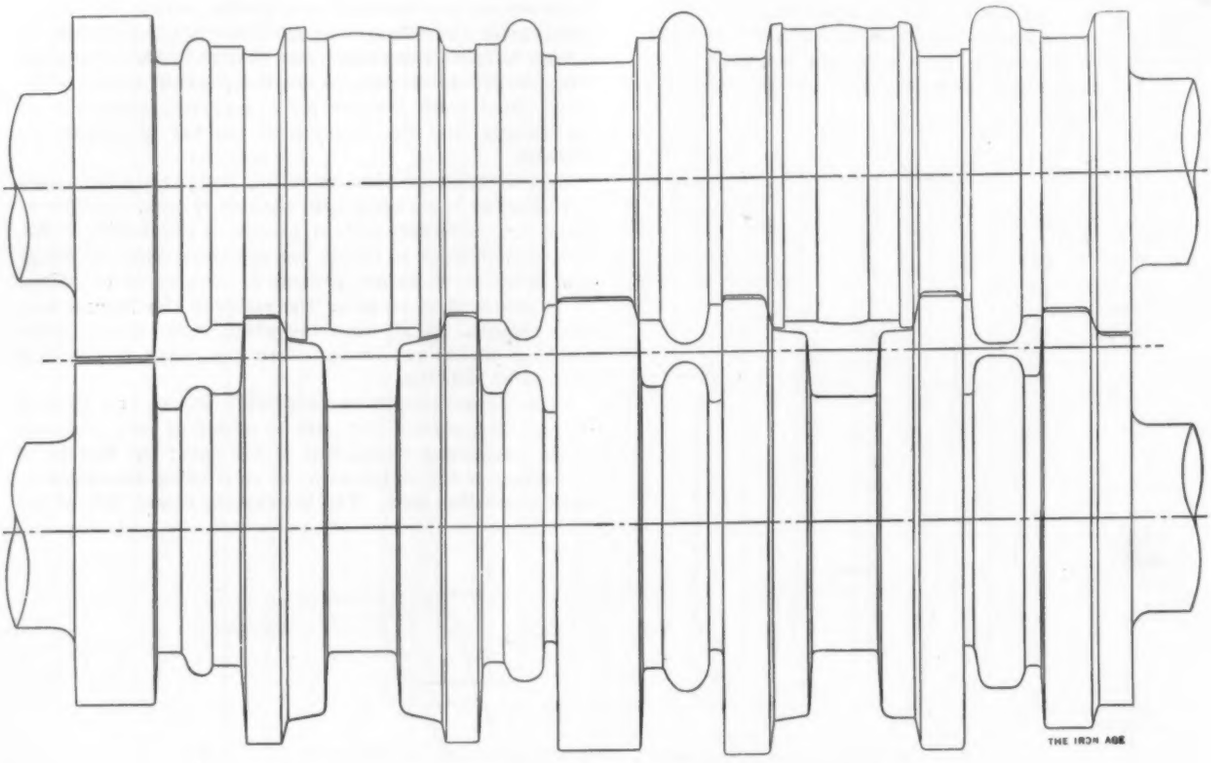


Fig. 3.—Roughing Rolls for Tramway Rails.—Scale, ¾ Inch to 1 Foot.

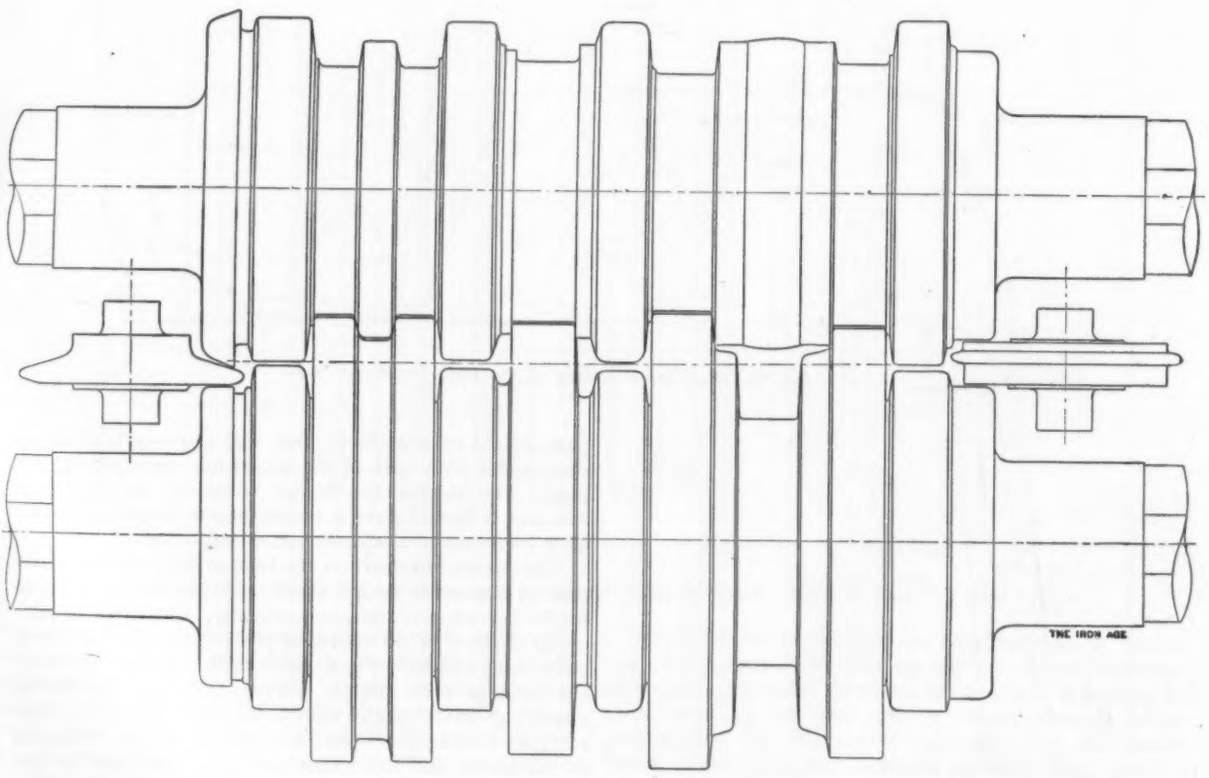


Fig. 4.—Finishing Rolls for Tramway Rails.—Scale, ¾ Inch to 1 Foot.

By this system, from a 7¼-inch square bloom reheated to a high temperature a 20-pound per foot flange rail was rolled in seven passes to 70 feet in length.

There is, however, no universal acceptance of this system, owing to the difficulties encountered through the lowering of temperature of the flanges, it being necessary to reheat the bloom to a sufficiently high temperature that

the heat may be well retained to the finishing passes. Secondly, the heavy draft being applied exclusively to the web, the longitudinal elongation causes the flanges to lower, the side pressure being limited, and would necessitate either rolling at a very high temperature or an abnormal length of flange in the early stages.

With such a section as the one now under consideration, the requisite width of flange would with difficulty be obtained, if not submitted to the action of the slabbing pass after the division between the head and sole had been made. The work, however, in slabbing processes being chiefly on the flanges, the head and web of the rail being the larger area and receiving but little or practically no draft, prevents the elongation of the bar, and by the consequent lateral extension of the metal the requisite width of flange is obtained. This, in the succeeding passes, is further reduced by a proportionately uniform draft over the section, thus minimizing the risk of tearing the flanges, which would otherwise probably be the case.

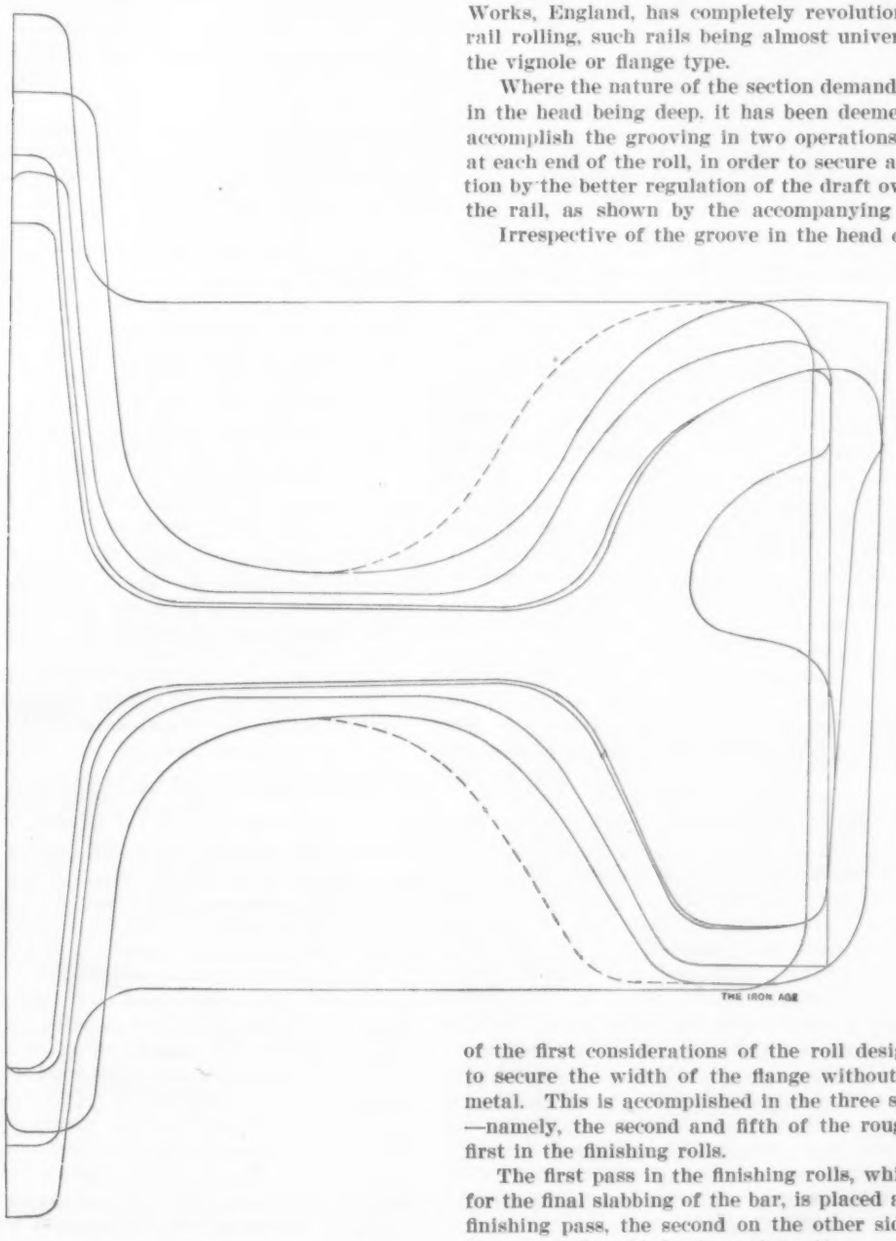


Fig. 5.—Finishing Passes for a Small Flange Rail Grooved Out in One Operation.—Full Size.

The proportioning of draft throughout a section is practically impossible of being reduced to a mathematical basis. For example, in a flange rail, as in any other unequal section, the draft would not be applied on the web of the rail in proportion to the width and thickness of the flanges. Allowance must be made for motive power available, the flanges cooling more rapidly than the head, unequal temperature being in effect similar to unequal draft and would vary under unequal conditions. As the area of the bar is reduced in a succession of passes, this variation of temperature in the different parts of a section becomes more marked. Fig. 2*a* shows the full sized section of the four finishing passes.

Figs. 3 and 4 indicate the roughing and finishing rolls for rolling tramway rails.

The rolling of street tramway rails with a loose roller placed between the bearings in the housings, as first introduced by J. M. While, manager of the Barrow Steel Works, England, has completely revolutionized tramway rail rolling, such rails being almost universally rolled of the vignole or flange type.

Where the nature of the section demands it, the groove in the head being deep, it has been deemed advisable to accomplish the grooving in two operations, with a roller at each end of the roll, in order to secure an accurate section by the better regulation of the draft over the head of the rail, as shown by the accompanying drawings.

Irrespective of the groove in the head of the rail, one of the first considerations of the roll designer would be to secure the width of the flange without injury to the metal. This is accomplished in the three slabbing passes —namely, the second and fifth of the roughing, and the first in the finishing rolls.

The first pass in the finishing rolls, which is designed for the final slabbing of the bar, is placed adjacent to the finishing pass, the second on the other side of the slabbing, and the third adjacent to the pass which plows out the groove in the head of the rail. After being submitted to the action of the first grooving pass, the bar is immediately traversed and the grooving completed in the finishing pass at the other end of the roll. These rolls were designed to roll direct ingots 18 inches square at the base, weight 30 hundredweight, the bloom on leaving the cogging being 8 x 8½ inches.

The steadying collars usually placed on each end of the roll are dispensed with in this design owing to the action of the live rollers, but the necessary degree of rigidity is insured by the small collar on the top roll being fitted into a groove cut in the collar on the bottom roll, which divides the third and fourth passes.

Small sections, however, are satisfactorily grooved out in one operation, a slight lip being formed in the rolling, in the last pass but one, on the head of the rail, to

counterbalance the back set of the metal while the groove is being plowed out in the finishing operation, as shown by Fig. 5, which represents the finishing passes for a small flange rail grooved out in one operation. The draw

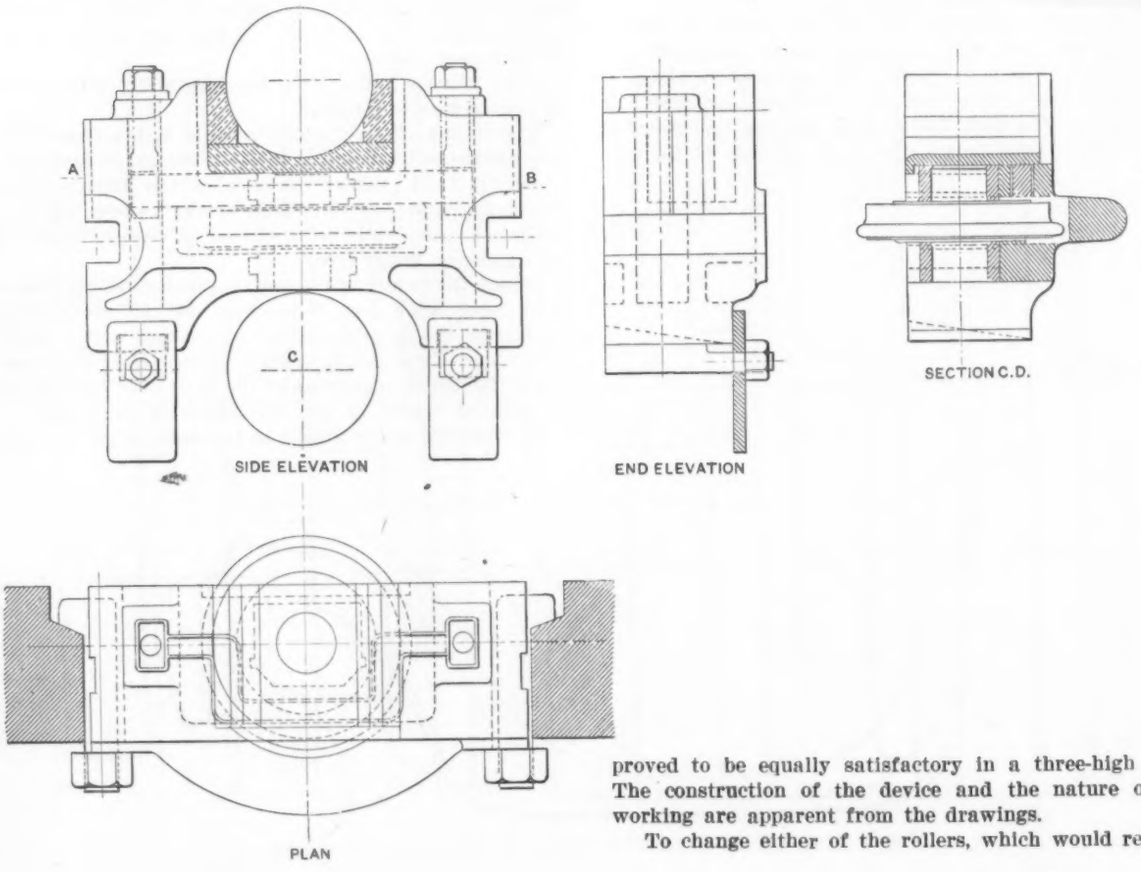


Fig. 6.—Chuck for Grooving Out Tramway Rails.—Scale, ¾ Inch to 1 Foot.

and spread of the rolls are distinctly shown by the drawings.

Another development of this system is as follows: An independent pair of rolls contains the two finishing passes only, a single collar in the center of the roll supporting the flanges, while the steadying collars are placed at the ends of the roll. The body of the roll is cut out sufficiently to allow the carriage or chuck holding the loose roller to slide in between the rolls, one in front of each pass. The bar is passed through the first groove, turned over and repassed through the second. Care should be exercised that the loose roller (in either design) should never come in contact with either of the working rolls, as otherwise the bar will not enter the pass.

The accompanying sketch represents the chuck designed by J. M. While for grooving out tramway rails. In its construction it is strong and admirably adapted to its purpose, all the parts, exclusive of the bearings, being made of steel, and is easily adjusted in any ordinary rail mill. It was designed for a reversing mill, with a pitch or center line of rolls 28 inches in diameter, but has been proved to be equally satisfactory in a three-high mill. The construction of the device and the nature of its working are apparent from the drawings.

To change either of the rollers, which would require

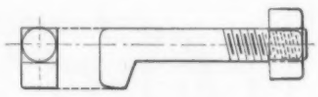


Fig. 7.—The Bolts Required for Tightening the Chuck.—Scale, ¾ Inch to 1 Foot.

to be done after rolling about 200 tons of rails, the most approved plan is as follows: The top roll should be held in suspension while the chuck, together with the bearings,

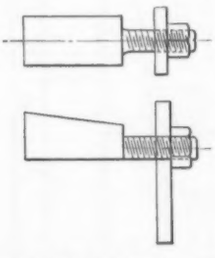


Fig. 8.—The Beveled Bolt Designed to Keep the Chuck in Position.—Scale, ¾ Inch to 1 Foot.

is easily withdrawn outwardly from the neck of the roll. A spare chuck with the loose roller fixed in position being in readiness, the operation need cause but little delay.

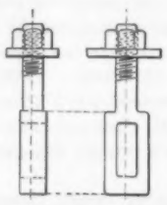


Fig. 9.—The Bolts for Lifting the Bar, Fig. 7, Into Position.—Scale, ¾ Inch to 1 Foot.

This device has proved very successful in its admitting of a nice adjustment and regulation of draft to secure an accurate section.

Arrangements for lubrication of the bearings of the loose roller are not shown by the drawings. This was provided for by inserting a self feeding oil can in a small pipe leading to the neck of the loose roller.

Fig. 7 represents the bar which supports the top roll; Fig. 8 the bolts required for tightening the chuck so as to press the wheel or loose roller into position against the head of the rail; Fig. 9 the beveled bolt designed to keep the chuck in position relative to the groove in the head of the rail; Fig. 10 the bolts for lifting the bar (designated by Fig. 7) into position. This bar, Fig. 7, designed for rolls 28 inches in diameter, should be 4 inches deep.

(*Conclusion.*)

Duties on Various Steel Products.

Steel Wool.

H. J. Webster, Assistant Counsel to the Government, filed a brief with General Appraiser Fischer, New York, on October 26, setting forth the position of the Government on the steel wool controversy which is now before Mr. Fischer for decision.

Steel wool is an article largely imported to take the place of sandpaper and emery. It is used as an abrasive and polisher in furniture and wood working factories and in many other industries where sandpaper has been used. It is practically only steel shavings and was originally a by-product in the manufacture of loom heddles, but the demand for it became so great that it is now made commercially, and a machine for the purpose of making it has been patented. It is imported by the Buehne Steel Wool Company of New York from Freiburg, Germany.

The process of making has much to do with the claim for a lower duty by the importers. It is being assessed by the appraisers at 45 per cent. as an article composed wholly of steel under the "manufactures of metal" clause, and the importers claim that it is dutiable as an article manufactured from steel wire at the rate of duty which would be imposed on the wire used in its manufacture, plus an additional duty of 1¼ cents a pound. The kind of wire which Buehne & Co. allege is used in the manufacture of the steel wool is dutiable at 1¼ cents a pound, so that the duty claimed on the steel wool is 2½ cents a pound. The duty at 45 per cent. ad valorem would be many times that.

The process of making the wool as described by the importers is as follows: The wire is stretched over a frame and underneath a tool which is so arranged as to shred the wire into filaments having a triangular shape. This shape is in order to make it as sharp as possible for polishing and abrasive purposes. A thin shaving is first cut from the wire in order to present a flat surface to the tool, and the tool then begins its work. When the residue of the wire becomes too thin to stand the strain it is thrown into the scrap basket. The material is imported in various sizes and degrees of fineness.

The contention of the Government is that Congress only intended the clause for manufactures of wire to apply to articles into which the wire entered and in which it remained in its entirety, and that such a use of wire was never contemplated. Mr. Webster points out the practical difficulty of applying the clause for manufactures of wire in the impossibility of ascertaining the size or quality of wire used in its manufacture or the proportion of the original wire used and the proportion discarded. Moreover, it is admitted that the wool may be made from bands or strips of steel or may be produced as a by-product in the manufacture of other articles. In this case, if it were to be assessed on the basis of the article from which it is produced, different importers would be paying different rates of duty on what was practically an identical article. It is also pointed out that the wool is worth from seven to ten times as much as the wire from which it is made, and that while the duty imposed on the wire is from 40 to 50 per cent., that which the importers wish to have imposed on the wool would be only about 15 per cent.

Steel Shot or Iron Sand.

A hearing will be held in a few days before General Appraiser Lunt to determine the dutiable classification of steel shot or "iron sand," imported from England by Harrison Brothers of Boston. One hearing has already been held in Boston, but the Government wishes to put in additional testimony.

The whole issue turns on whether the balls are steel or iron, and it is likely that several iron and steel experts will be called to testify on both sides. The shot consists of small globules of very hard steel or chilled iron, and is used in connection with a steel tool for sawing granite and marble. It is made by fusing a mixture of pig iron and steel scrap and letting the molten metal run down a small inclined trough. As it leaves the trough it comes in contact with an air blast, which separates it into globules, and blows them into a trough of cold water. They are then screened and assorted as to size. It is contended by the importers that the shot is composed of steel and is dutiable at specific rates according to value under the provision for steel in all forms and shapes not otherwise provided for. The Government contends that it is composed of iron, surface chilled, and that it is dutiable as a manufacture of metal at 45 per cent.

In favor of the Government's contention is the fact that similar goods imported by other manufacturers have been classified as manufactures of iron. These goods were made in Scotland. Harrison Brothers declare that the goods imported by them from England are made by a different process, but a member of the firm admitted during the examination in Boston that he had often substituted the Scotch goods for his own and that they had served the purpose.

Sheet Steel in Strips.

A hearing on the dutiable classification of sheet steel in strips is to be held before General Appraiser Fischer at the Appraisers' Stores, New York, on November 15, at which testimony to sustain the contention of Hermann Boker & Co., the importers, will be put in. The question has already been thoroughly threshed out before the general appraisers and the courts, and the United States Circuit Court of Appeals has decided in favor of Boker & Co. The Government, however, has reopened the question of making a new case, which, whatever the decision of the general appraisers, will probably have another run through the courts.

The issue involves both the method of manufacture and the commercial designation of the article. The goods are strips of sheet steel from ½ inch to about 10 inches wide, and imported in lengths of from 50 to 200 feet. The Government contends that the sheets are rolled in the mill in the shape in which they are imported and that they are dutiable under the clause of paragraph 137 of the Dingley law providing a duty of 45 per cent. on sheet steel in strips. The contention of the importers is that the strips are cut from sheets of steel after they have been rolled and that they are dutiable at various specific rates, according to value, under the clause of paragraph 135 providing for steel in all forms and shapes not otherwise provided for. The Government believes that it has a much stronger case this time than it had previously, and that it will be able to put in a great deal of new testimony to sustain its contention.

A Large Order for Marine Chain.—Bradlee & Co., Philadelphia, Pa., have just completed and shipped one of the largest orders for marine railway chain ever placed. It was for the Southern Pacific Company, under contract from H. L. Crandall & Son Company, East Boston, Mass., and consisted of 132,940 pounds, a large part being of 2⅞ inches diameter. The total length was 4296 feet. A representative of the Crandall Company witnessed the testing to destruction of a certain number of links which he selected from the 2⅞-inch chain, which broke at 462,800 pounds, which is very high in comparison with the requirements for 2⅞-inch chain of such authorities as the following: United States Navy, 404,719 pounds; United States Light House Establishment, 430,336; Lloyd's Register of British and Foreign Shipping, 379,020. Trail, the standard English authority on chain, gives as his breaking strength for this size of chain 404,720 pounds.

The Influence of Carbon, Phosphorus, Manganese and Sulphur on the Tensile Strength of Open Hearth Steel.*

BY H. H. CAMPBELL, STEELTON, PA.

Many attempts have been made to write a formula by which to calculate the strength of steel from its chemical composition, but most of these endeavors have failed because there were too many disturbing conditions. It is idle to collect from the pages of trade papers, books or the proceedings of scientific societies a multitude of observations. The combination of such results will simply show that steel of the same composition will vary in tensile strength through wide limits—a fact that has been known for generations. That cold working, overheating and many another form of heat treatment alter fundamentally the strength of steel is ancient history, although it is only recently that the microscope has pointed out the road to an explanation of the phenomena.

It may be urged that the microscopic structure must be taken into consideration in any formula giving the ultimate strength, but from the standpoint of the present investigation this is unnecessary. We are trying to determine, primarily, not what changes in ultimate strength may be made by variations in the condition of carbon, but what effect is produced by changes in the amount of carbon when its condition remains constant. For such an inquiry, in order that the condition of the carbon should remain as nearly uniform as possible, it is essential that all test pieces be made under the same conditions; and it is believed that the tests described in this paper satisfy that requirement. The investigations were made at the works of the Pennsylvania Steel Company, Steelton, Pa.; the ingots from which the tests were made were 6 inches square in every case; they were heated in the same furnace and forged at the same hammer into billets of the same size; these billets were reheated in the same furnace by the same men and rolled in the same set of rolls into 2 x ⅝ inch bars of about the same length. These were cooled under the same conditions, broken in the same machine by the same men, and analyzed in the same laboratory by the same staff.

First Investigation.

About ten years ago extensive calculations were made on such bars at Steelton by the method of least squares.† In this case the bars of similar composition were grouped together, and the carbon of the group was determined by combustion upon a sample containing an equal amount of drillings from each bar. Such a grouping of the tests would give rise to error if unlike bars were put together, so that this was avoided as far as possible. A greater cause of trouble lies in the fact that, in the method of least squares, any error in one factor affects the other factors. If for any reason the value of phosphorus comes out higher than the real truth, the value of carbon may suffer accordingly. Still greater is the objection that no factor can be used in the work unless it really has a decided influence on the results. This was illustrated when sulphur and copper were used as factors, the values found for them being absurd.

In acid steels it appeared that carbon and phosphorus were the important elements to be considered, and it was assumed that the strength of steel was made up of the effect of a certain content of iron, plus the effect of a certain content of carbon, plus the effect of a certain content of phosphorus. Thus, in a metal containing 0.20 per cent. of carbon and 0.08 per cent. of phosphorus, and having a tensile strength of 70,000 pounds per square inch, we may write the following equation (the iron being determined by difference):

20 C + 8 P + 9972 Fe = 70,000, C, P and Fe being constants, representing the effect upon the tensile strength in pounds per square inch of 0.01 per cent. of carbon, phosphorus and iron, respectively. In this way each group of tests furnished a formula, and the combination of these by the method of least squares gave the following results:

For Acid Steel: (C = 1210; P = 890; Fe = 38,600.)

38,600 iron + 1210 carbon + 890 phosphorus + R = ultimate strength.

For Basic Steel: (C = 950; P = 1050; Fe = 37,430, and Mn = 85.)

37,430 + 950 carbon + 1050 phosphorus + 85 manganese + R = ultimate strength.

The iron, carbon, phosphorus and manganese are expressed in units of 0.01 per cent., and R, as well as the ultimate strength, in pounds per square inch. R is a variable, to allow for heat treatment. In angles and plates, about ⅜ or ½ inch in thickness, and finished at a fairly high temperature, R is zero.

In this formula Fe, 38,600, represents the value independently determined for pure iron. From a mathematical standpoint there can be no objection to including iron as one of the factors in the problem, but practically there are the following reasons to the contrary:

1. There is a doubt whether the real basis of strength varies with each increase or decrease in the total metallic iron. It may be that the datum plane is the same whether the steel contains 99.6 per cent. or 99.1 per cent. of iron.

2. Since the iron is determined by difference, all the errors in determining carbon, manganese and phosphorus, as well as the total contents of sulphur, copper, silicon and other elements, may make a composite error of no small moment; and this is all embodied in the figure representing iron.

3. The range of variation in the percentage of iron is not sufficiently great to give a good working basis.

Notwithstanding all these objections to the methods of determination, the derived formulæ given above have been of the utmost practical importance. They have been applied to every heat of steel made by the Pennsylvania Steel Company for the last ten years, and there has rarely been, in the ultimate strength of soft steels, a difference of more than 2500 pounds per square inch between the result given by the formula and the record of the testing machine. In most cases the error has been much less than 1500 pounds; and so great is our confidence in the formulæ that chemical determinations are always repeated when they are not confirmed by the machine test. In view of such an experience in every day commercial work it would be rash to say that the method is entirely wrong or that formulæ do not represent actual conditions.

Second Investigation.

To check the first investigation two entirely new series of bars were collected—one of nearly 700 from acid heats and the other of 1100 from basic heats. Duplicate determinations were made on each bar for phosphorus and manganese. The carbon was determined in three ways: 1, The bar was analyzed by combustion (duplicate tests being made in case of doubt); 2, the bar was analyzed by the color test; 3, a piece of the ingot from which the bar had been made was cut off at the hammer and analyzed by the color test.

Three bars were pulled on each heat, two on one testing machine and one on another. The figure used is the average of the results obtained on the two mcahines, not the average of the three bars.

In order to plot the data all heats were combined which showed carbon from 0.075 to 0.125 per cent.; from 0.125 to 0.175 per cent., and so on, making a division for each additional 0.05 per cent. of carbon. Table I gives the list of groups thus formed.

The division of the groups according to the way in which the carbon was determined is important, because many heats may change their grouping according to the way the carbon is determined; thus, if a heat showed 0.12 per cent. of carbon by combustion, it would appear in Fig. 1 in line AA, at the point representing the range between 0.075 and 0.125 per cent. of carbon; while, if the color determination showed 0.14 per cent., it would appear in the line BB at the point representing the range between 0.125 and 0.175 per cent. In this way the three sets of lines may be viewed as the result of three independent investigations.

The lines AA, BB and CC in Fig. 1 are not plotted

* Read at the New York meeting of the Iron and Steel Institute, October 26.

† Full details of the work will be found in "The Manufacture and Properties of Iron and Steel," pp. 482-528. Engineering & Mining Journal Company, New York, 1904.

directly from Table I, but the data have been combined by recognized scientific methods to allow for the unequal

TABLE I.—*List of Groups Used in Determining the Effect of Carbon, Phosphorus and Manganese.*

Division.	Number of Heats.	Average Chemical Composition.			Ultimate Strength.
		Carbon.	Phosphorus.	Manganese.	
		Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. In.
A, acid test-bars; carbon by combustion.	50	0.1118	0 0545	0.408	58,012
	131	0.1463	0.0567	0.437	61,039
	58	0.1995	0.0579	0.475	66,809
	22	0.2463	0.0563	0.484	70,736
	50	0.3065	0.0476	0.528	79,058
	120	0.3501	0.0466	0.537	83,093
	103	0.4000	0.0400	0.518	87,156
	86	0.4491	0.0376	0.520	92,824
	42	0.4961	0.0363	0.519	98,224
	8	0.5460	0.0354	0.495	102,346
	6	0.5863	0.0330	0.493	107,398
B, acid test-bars; carbon by color.	45	0.113	0.0545	.....	58,535
	164	0.145	0.0568	.....	62,407
	47	0.197	0 0560	.....	67,052
	8	0.249	0.0527	.....	72,728
	36	0.304	0.0494	.....	80,776
	53	0.352	0.0380	.....	86,369
	45	0.395	0.0358	.....	92,759
	18	0.444	0.0330	.....	98,576
	2	0.480	0.0360	.....	103,120
C, acid test-ingots; carbon by color.	34	0.118	.....	.....	57,599
	160	0.145	.....	.....	61,189
	61	0.190	.....	.....	67,482
	17	0.250	.....	.....	74,239
	84	0.307	.....	.....	80,491
	160	0.346	.....	.....	85,073
	98	0.397	.....	.....	91,434
	59	0.446	.....	.....	97,439
	15	0.507	.....	.....	105,656
D, basic test-bars; carbon by combustion.	135	0.0451	0.0082	0.243	46,703
	125	0.0974	0.0084	0.422	50,013
	134	0.1521	0.0116	0.436	55,650
	246	0.2044	0.0113	0.472	61,236
	263	0.2484	0.0110	0.474	64,744
	125	0.2935	0.0106	0.464	68,307
	27	0.3413	0.0113	0.461	72,065
	11	0.3932	0.0120	0.499	78,625
	1	0.4310	0.0070	0.390	83,305
E, basic test-bars; carbon by color.	173	0.047	0.0076	.....	47,084
	96	0.093	0.0100	.....	51,228
	189	0.154	0.0122	.....	58,202
	322	0.200	0.0118	.....	63,184
	235	0.248	0.0116	.....	65,813
	51	0.288	0.0125	.....	70,786
	3	0.343	0.0087	.....	79,252
F, basic test-ingots; carbon by color.	131	0.057	.....	.....	46,431
	131	0.093	.....	.....	49,917
	152	0.150	.....	.....	56,264
	365	0.203	.....	.....	62,241
	210	0.246	.....	.....	66,401
	72	0.295	.....	.....	71,011
	10	0.350	.....	.....	80,013
	2	0.400	.....	.....	80,272

TABLE II.—*Combination of Data in Table I by Groups of Three, to Obtain Construction Points for the Lines in Fig.* 1.

Class.	Chemical Composition.			Ultimate Strength.
	Carbon.	Phosphorus.	Manganese.	
	Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. In.
A, acid test-bars; carbon by combustion; line AA.	0.1520	0.0565	0.440	61,806
	0.1713	0.0570	0.453	63,637
	0.2486	0.0537	0.497	72,185
	0.3268	0.0480	0.529	80,626
	0.3609	0.0443	0.528	83,886
	0.3943	0.0419	0.526	87,155
	0.4357	0.0384	0.519	91,278
	0.4693	0.0371	0.518	95,052
	0.5130	0.0355	0.513	99,795
B, acid-test bars; carbon by color; line BB.	0.1489	0.0562	0.443	63,072
	0.1600	0.0564	0.453	64,379
	0.2437	0.0541	0.491	72,980
	0.3255	0.0434	0.519	83,168
	0.3534	0.0403	0.515	87,012
	0.3827	0.0364	0.513	90,742
	0.4112	0.0351	0.506	94,689
C, acid test-ingots; carbon by color; line CC.	0.152	.....	.....	62,216
	0.164	.....	.....	63,734
	0.257	.....	.....	74,937
	0.327	.....	.....	82,893
	0.351	.....	.....	85,771
	0.381	.....	.....	89,341
	0.423	.....	.....	94,734
D, basic test-bars; carbon by combustion; line DD.	0.0978	0.0094	0.366	50,834
	0.1639	0.0107	0.450	57,001
	0.2115	0.0113	0.465	61,502
	0.2403	0.0110	0.471	64,086
	0.2681	0.0109	0.470	66,297
	0.3081	0.0108	0.466	69,626
	0.3582	0.0113	0.469	74,203
E, basic test-bars; carbon by color; line EE.	0.1010	0.0101	0.384	52,540
	0.1688	0.0116	0.458	59,739
	0.2036	0.0118	0.466	62,750
	0.2260	0.0118	0.468	64,839
	0.2564	0.0117	0.469	66,830
F, basic test-ingots; carbon by color; line FF	0.102	.....	.....	51,150
	0.168	.....	.....	58,339
	0.204	.....	.....	62,195
	0.227	.....	.....	64,575
	0.262	.....	.....	68,010
	0.304	.....	.....	72,303

number of heats in the groups. Thus, by combining groups 1, 2 and 3 we get the first point of AA; from groups 2, 3 and 4 we get the second point, and so on. The result of this combination gives Table II. The lines AA, BB, &c., plotted therefrom, are more nearly representative of the true conditions, and are straighter than lines would be if plotted directly from Table I.

In Fig. 1 are shown all six lines. The line BB, founded on the color determination of carbon in the acid test bar, agrees very closely with CC, founded on color carbons from the acid test ingot. In the same way, but less closely, the line EE, representing color carbons on the basic bar, agrees with the line FF, representing color carbons on the basic ingot. This additional investigation of the test ingot was undertaken simply as a check on the other results; and, since it agrees as nearly as could be expected with the color records on the bar, no further mention will be made of its results, comparison being made only between the combustion and the color work

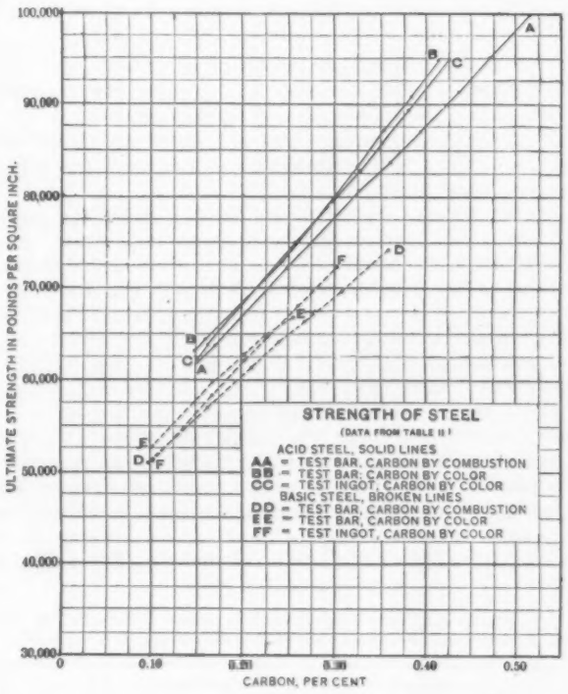


Fig. 1.—Strength of Steel.

on the test bar. It may be well, however, to note that the line FF does not dip down at the upper end like EE, and this fact, taken in conjunction with the straightness of all the other lines, indicates that this dip in EE must be caused by errors in determination.

In the acid steels there is quite a difference between AA and BB, and in the basic steels between DD and EE. For a given amount of carbon the results on the bar when analyzed by the color method show a higher tensile strength than when carbon is determined by combustion, because a certain amount of temper carbon is found by combustion which has little effect upon the ultimate strength. Determinations by color are often unsatisfactory, but when all the work is done in one laboratory the results may be looked upon as comparable, and the reasonable straightness of the lines, as plotted, is good evidence that the chemical work was reliable.

The lines AA, BB, &c., take no account of variation in the content of phosphorus or of manganese. It is well known that phosphorus in small proportions adds to the tensile strength. In the first investigation by the method of least squares it was found that 0.01 per cent. raised the strength of acid steel 890 pounds and basic steel 1050 pounds per square inch, and experience has indicated that these values are very near the truth. In the present investigation the value of carbon is first determined, and then that of manganese and phosphorus; but in order to find the value of carbon accurately it is essential to know the influence of both manganese and phosphorus. This makes necessary the method of successive approximations, the values found in the first approximation being used in the second, and so on until the changes made in values are unimportant. In the present case the methods

used avoid to some extent the dependence of one determination upon another. Thus, in the line of AA carbon is the one great variable; the proportions of phosphorus and manganese are not constant, but the groups of high carbon steel contain about the same amount of manganese and phosphorus as the groups of low carbon steel. and hence the line will give a provisional value of carbon. The general trend is determined by stretching a thread along its length and noting the tangent made with the horizontal. In this way the line AA indicates a value for carbon of about 1050 pounds for each 0.01 per cent. Allowances have yet to be made for the effect of phosphorus and manganese, but this figure serves as a working basis for similar provisional estimations of the other elements.

In explaining the method used to determine the value of phosphorus and manganese no mention will be made of these provisional values, the figures given being in each case the final results.

The Effect of Phosphorus on Acid Steel.

The investigation into the effect of phosphorus will be confined to acid steel, for in the basic steels under consideration the proportions of phosphorus were so low that the differences were almost within the limits of chemical error. Two methods have been used, one serving as a check upon the other.

First Method.—Referring to Table I under the head of acid steels, carbon determined by combustion, the first group is composed of 50 heats averaging 0.1118 per cent. of carbon, 0.0545 per cent. of phosphorus, 0.408 per cent. of manganese and 58,012 pounds per square inch in ultimate strength. These 50 heats were separated into two groups, of high and low phosphorus, respectively. The terms "high" and "low" are relative, and signify that the heats were arranged in a column according to their phosphorus content, the upper half of the list being called "high" and the lower half "low." The result of this process applied to each group gave in each case two equal divisions showing a certain difference in carbon, in manganese, in phosphorus and in ultimate strength. If the carbon and manganese had been uniform the effect of phosphorus could have been found by simple division; but since they both varied it was necessary to make allowance for them. If the difference in carbon were of any great amount a considerable error might be introduced; but as each group before division included only such heats as were within a range of 0.05 per cent. of carbon, the difference in this element in the high phosphorus and low phosphorus heats is in each case in the third decimal place.

TABLE III.—*Division of Heats to Determine the Effect of Phosphorus upon Acid Steel.*

NOTE.—In the sixth column an allowance is made of 1,000 lb. for 0.01 per cent. of carbon, and for manganese according to the sliding scale in Table VII.

Relative Phosphorus.	Chemical Composition.			Ultimate Strength.			Number of Heats in Group.	Product of Last Two Columns.
	Carbon.	Phosphorus.	Manganese.	Actual Records.	Difference Due to Phosphorus Alone.	Effect of 0.01 Per Cent. of Phosphorus.		
	Per Cent.	Per Cent.	Per Cent.	Lb. per Sq. Inch.	Lb. per Sq. Inch.	Lb. per Sq. Inch.		
High	0.1121	0.0635	0.405	58,543				
Low	0.1114	0.0456	0.411	57,481				
Diff.	0.0007	0.0179	0.006	1,062	1,045	584	50	29,200
High	0.1470	0.0652	0.444	62,088				
Low	0.1457	0.0483	0.432	60,006				
Diff.	0.0013	0.0169	0.012	2,082	1,808	1,070	131	140,170
High	0.1963	0.0667	0.481	67,443				
Low	0.2026	0.0490	0.470	66,174				
Diff.	0.0063	0.0177	0.011	1,269	1,723	973	58	56,434
High	0.2459	0.0658	0.489	71,292				
Low	0.2467	0.0484	0.481	70,275				
Diff.	0.0008	0.0174	0.008	1,017	937	539	22	11,858
High	0.3065	0.0564	0.546	80,111				
Low	0.3065	0.0399	0.509	78,005				
Diff.		0.0165	0.037	2,106	1,218	738	50	36,900
High	0.3466	0.0545	0.540	83,669				
Low	0.3543	0.0372	0.534	82,410				
Diff.	0.0077	0.0173	0.006	1,259	1,861	1,076	120	129,120
High	0.3969	0.0470	0.520	87,104				
Low	0.4031	0.0328	0.516	87,209				
Diff.	0.0062	0.0142	0.004	−105	387	273	103	28,119
High	0.4511	0.0441	0.524	93,673				
Low	0.4473	0.0311	0.517	91,975				
Diff.	0.0038	0.0130	0.007	1,698	1,066	820	86	70,520
High	0.4949	0.0407	0.521	98,318				
Low	0.4970	0.0327	0.517	98,145				
Diff.	0.0021	0.0080	0.004	173	226	282	42	11,844
High	0.5430	0.0433	0.508	104,047				
Low	0.5508	0.0275	0.483	100,645				
Diff.	0.0078	0.0158	0.025	3,402	3,082	1,951	8	15,608
High	0.5815	0.0415	0.500	109,367				
Low	0.5898	0.0288	0.490	106,412				
Diff.	0.0083	0.0127	0.010	2,955	3,321	2,615	6	15,690
Total							676	545,463
Average								807

Table III shows the first method of finding the value of phosphorus from the acid steel bars in Table I. In each group we find the difference in ultimate strength, then allow for the variation in carbon, and in manganese, and find the difference in ultimate strength due to phosphorus alone; then divide by the variation in phosphorus and obtain the effect of one unit of phosphorus in the one group under consideration. If all the groups were composed of the same number of heats it would suffice to take an average of these values of phosphorus, but as each group is made up of a different number it is necessary to make a true average by multiplying the value found for each group by the number of heats in the group, and divide the sum of these results by the total number of heats. In this way the first method gives a value for phosphorus in acid steel of 807 pounds for 0.01 per cent.

Second Method.—The bars were classified as before according to carbon, and then each of these main groups was subdivided according to phosphorus. Heats containing 0.03 per cent. of phosphorus constituted one group; those with 0.031 per cent. another; those with 0.032 per cent. another, and so on. Having made a list of these groups they were put together so as to give four or five points with about an equal number of heats in each, the result being shown in Table IV. In the last column is given what may be called the base, or the strength of the iron and phosphorus after allowing for carbon and manganese; this last column is plotted in Fig. 2. By combining the groups so as to rectify the lines by the method used in Table II it will be found that in the line representing heats ranging between 0.075 and 0.224 per cent. of carbon the phosphorus has a value of about 860 pounds for each 0.01 per cent.; in the range from 0.225 to 0.374 per cent. of carbon the value is 940 pounds; between 0.375 and 0.524 per cent. of carbon it is 1290 pounds. This would indicate that as the percentage of carbon increases the effect of each unit of phosphorus increases, but the difference is so unimportant and the margin of certainty so narrow that it will be better to make a true average of the three values. There were 239 heats giving a value of 860 pounds, 192 heats giving 940 pounds, and 231 heats giving 1290 pounds, so that the true average is 1033 pounds. For the sake of simplicity the value of 0.01 per cent. of phosphorus will be taken as 1000 pounds.

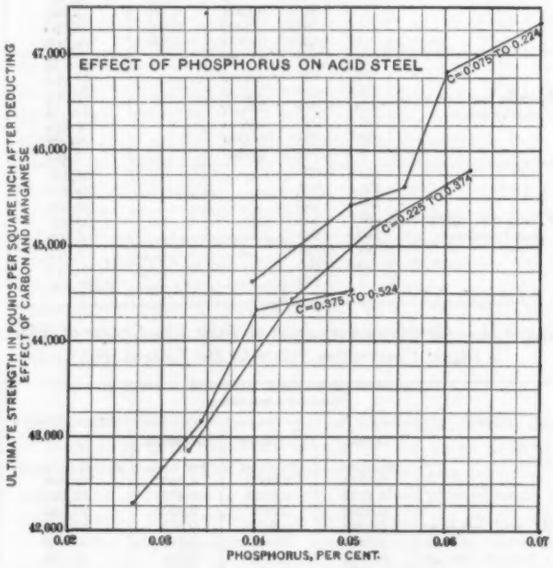


Fig. 2.—Effect of Phosphorus on Acid Steel.

In reducing to a zero base, as in the last column of Table IV, there will be certain errors, since the values of

carbon and manganese are not inerrant; but the original classification into groups of about the same carbon minimizes the disturbing effect. Thus in Table IV the first main division has five units; the highest carbon is 0.1540 per cent., and the lowest 0.1491 per cent., a variation of 0.0049 per cent. Carbon has been valued at 1000 pounds for 0.01 per cent., and if perchance that value is in error by 50 pounds the results determined from that division of the table will be wrong by only $50 \times 0.49 = 25$ pounds. The last column shows a strength of 47,328 pounds for one base and 44,616 pounds for the other, a difference of 2712 pounds, so that the assumed error of 50 pounds in the value of carbon produces an error of only 1 per cent. in the value of phosphorus in this particular division. This argument applies also to the determination of the other elements in both acid and basic steel.

Another important consideration applying equally to the work on phosphorus and on manganese is the concordance of results obtained from different divisions. A general average obtained by grouping any data into two primal divisions gives conclusions of very limited value, but in this paper the practice is followed of subdividing in order to compare results. Thus from three independent lines of Fig. 2 the values of phosphorus varied from 860 to 1290 pounds. It is quite possible that these variations were not accidental, and that the variation represents a law of increasing effect with higher carbons, but leaving all this aside it is certain that three separate determinations roughly agreeing with one another establish with reasonable certainty the general fact that 0.01 per cent. of phosphorus has a strengthening effect of somewhere about 1000 pounds. The validity of the conclusions is immeasurably superior to one based on a general average.

TABLE IV.—*Classification of Acid Heats According to Content of Phosphorus.*

NOTE.—In the last column a value of 1,000 lb. is given to 0.01 per cent. of carbon; the figure for manganese is taken from Table VII. Fig. 3 is plotted from the last column, but the data are combined to rectify the lines.

Limits of Carbon.	Number of Heats.	Chemical Composition.				Ultimate Strength.	
		Carbon.	Phosphorus.	Manganese.	Sulphur.	Actual Records.	After Deducting for Carbon and Manganese.
Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch.
	39	0.1491	0.0396	0.439	0.0539	59,994	44,616
	54	0.1524	0.0500	0.430	0.0559	61,038	45,438
0.075 to 0.224	38	0.1504	0.0557	0.441	0.0568	61,595	46,063
	61	0.1528	0.0617	0.445	0.0588	62,633	46,813
	47	0.1540	0.0717	0.447	0.0623	63,292	47,328
	46	0.3373	0.0331	0.514	0.0477	79,636	42,805
0.225 to 0.374	53	0.3317	0.0438	0.537	0.0529	81,231	44,444
	44	0.3265	0.0523	0.527	0.0538	81,197	45,194
	49	0.3120	0.0626	0.537	0.0537	80,390	45,792
	52	0.4413	0.0271	0.514	0.0437	90,413	42,270
0.375 to 0.524	63	0.4424	0.0343	0.508	0.0461	91,180	43,138
	54	0.4366	0.0404	0.521	0.0494	92,215	44,320
	62	0.4235	0.0504	0.534	0.0526	91,370	44,517

Effect of Manganese on Acid Steel.

First Method.—The heats were divided into "low" and "high" manganese in the same way and within the same carbon limits as already described in the determination of phosphorus. The results as given in Table V show that the effect of one unit of manganese is greater as the carbon increases. The increase is not regular, but this is partly explained by the small number of heats in some of the groups. Combining the data so as to have three larger groups, and plotting the results, it was found that for each increase of 0.01 per cent. of carbon the effect of 0.01 per cent. of manganese was 10 pounds more—that is to say, if 0.01 per cent. of manganese strengthens a steel of 0.2 per cent. of carbon by 160 pounds it will strengthen a steel of 0.21 per cent. of carbon by 170 pounds. In the second method of determining manganese it is found that the increment is 8 pounds, which agrees fairly well with this valuation.

Second Method.—The heats were divided according to their content of manganese in the same way as explained in the second determination of phosphorus. The results as given in Table VI and in Fig. 3 show that when the manganese is above 0.4 per cent. each increase in that element raises the strength, while with contents below 0.4 per cent. the tensile strength increases as the manganese decreases. The number of observations of low

TABLE V.—*Division of Heats to Determine the Effect of Manganese upon Acid Steel.*

NOTE.—In the eighth column a value is given both to carbon and phosphorus of 1,000 lb. for 0.01 per cent.

Limits of Carbon	Relative Manganese	Number of Heats.	Chemical Composition.			Ultimate Strength		
			Carbon.	Phosphorus.	Manganese.	Actual Records.	Difference Due to Manganese Alone.	Effect of 0.01 Per Cent. of Manganese
Per Cent.			Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
	High.	27	0.1156	0.0564	0.440	58,847		
0.075 to 0.124	Low..	23	0.1073	0.0524	0.370	57,031		
	Diff..		0.0083	0.0040	0.070	1,816	586	84
	High.	63	0 1517	0.0572	0.476	62,008		
0.125 to 0.174	Low..	68	0.1413	0.0562	0.402	60,142		
	Diff..		0.0104	0.0010	0.074	1,866	726	98
	High.	27	0.1974	0.0590	0.514	66,936		
0.175 to 0.224	Low..	31	0.2012	0.0567	0.440	66,698		
	Diff..		0.0038	0.0023	0.074	238	388	52
	High.	10	0.2413	0.0551	0.519	70,602		
0.225 to 0.274	Low..	12	0.2505	0.0574	0.456	70,850		
	Diff..		0.0092	0.0023	0.063	−248	902	143
	High.	26	0.3018	0.0524	0.568	79,926		
0.275 to 0.324	Low..	24	0.3083	0.0425	0.486	78,118		
	Diff..		0.0035	0.0099	0.082	1,808	1,168	142
	High.	59	0.3513	0.0476	0.582	84,670		
0.325 to 0.374	Low..	61	0.3489	0.0458	0.493	81,569		
	Diff..		0.0024	0.0018	0.089	3,101	2,661	299
	High	53	0.3987	0.0405	0.556	88,554		
0.375 to 0.424	Low..	50	0.4014	0.0394	0.478	85,675		
	Diff..		0.0027	0.0011	0.078	2,879	3,039	390
	High.	45	0.4492	0.0383	0.560	94,174		
0.425 to 0 474	Low..	41	0.4490	0.0368	0.476	91,465		
	Diff..		0.0002	0.0015	0.084	2,709	2,539	302
	High.	22	0.4970	0.0374	0.557	100,097		
0.475 to 0.524	Low..	20	0.4948	0.0352	0.477	96,163		
	Diff..		0.0022	0.0022	0.080	3,934	3,494	437
	High.	4	0.5500	0.0383	0.518	104,248		
0.525 to 0.574	Low..	4	0.5440	0.0325	0.473	100,445		
	Diff..		0.0060	0.0058	0.045	3,803	2.623	583
	High.	3	0.5827	0.0377	0.533	109,945		
0.575 to 0.624	Low..	3	0.5897	0.0283	0.453	104,850		
	Diff..		0.0070	0.0094	0.080	5,095	4,855	607

manganese acid steels is not sufficient to prove this conclusively, but on another page it will be shown that in basic steel also a decrease in the manganese content below a certain point is not accompanied by a decrease in

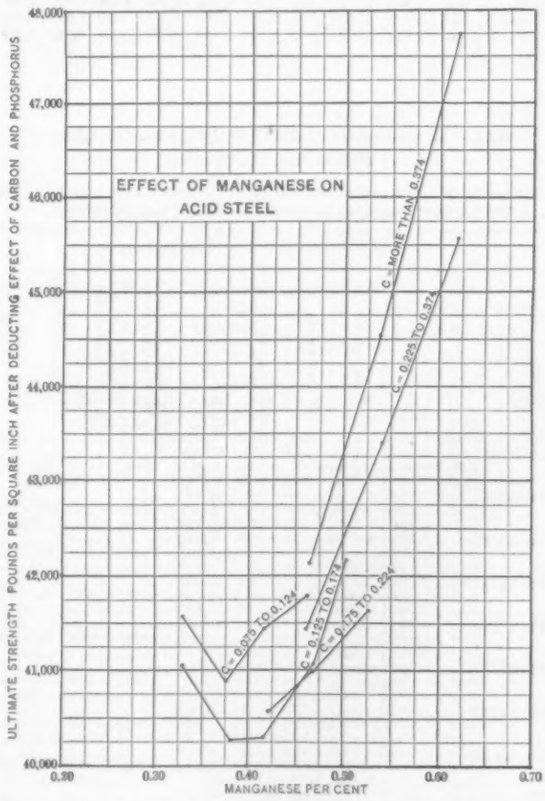


Fig. 3.—Effect of Manganese on Acid Steel.

strength. It is probable that low manganese implies the presence of oxide of iron, and that this strengthens the steel much more than it is weakened by the decrease in manganese.

The lines in Fig. 3 show that each increase in man-

TABLE VI.—*Classification of Acid Heats According to Content of Manganese.*

NOTE.—In the last column both carbon and phosphorus are valued at 1,000 lb. for 0.01 per cent.

Limits of Carbon.	Limits of Manganese.	Number of Heats.	Chemical Composition.				Ultimate Strength.	
			Carbon.	Phosphorus.	Manganese.	Sulphur.	Actual Records.	After Deducting for Carbon and Phosphorus.
Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
0.075 to 0.124	0.30 to 0.35	6	0.1052	0.0548	0.330	0.0560	57,558	41,558
	0.36 to 0.39	12	0.1117	0.0500	0.377	0.0576	57,047	40,877
	0.40 to 0.44	20	0.1110	0.0564	0.416	0.0589	58,173	41,433
	0.45 to 0.49	11	0.1168	0.0568	0.462	0.0636	59,135	41,775
0.125 to 0.174	0.30 to 0.35	2	0.1330	0.0585	0.330	0.0550	60,200	41,050
	0.36 to 0.39	19	0.1354	0.0538	0.381	0.0564	59,189	40,269
	0.40 to 0.44	55	0.1459	0.0569	0.417	0.0579	60,560	40,280
	0.45 to 0.49	41	0.1477	0.0564	0.470	0.0595	61,483	41,073
	0.50 to 0.59	14	0.1608	0.0601	0.503	.....	64,258	42,163
0.175 to 0.224	0.40 to 0.44	16	0.2004	0.0562	0.422	0.0504	66,237	40,577
	0.45 to 0.49	23	0.2016	0.0587	0.468	0.0567	67,020	40,990
	0.50 to 0.59	19	0.1960	0.0579	0.527	.....	67,035	41,645
0.225 to 0.374	0.40 to 0.49	47	0.3127	0.0476	0.461	.....	77,471	41,441
	0.50 to 0.59	122	0.3305	0.0482	0.541	.....	81,257	43,387
	0.60 to 0.69	19	0.3413	0.0476	0.618	.....	84,463	45,573
Over 0.374	0.40 to 0.49	83	0.4495	0.0359	0.465	.....	90,680	42,140
	0.50 to 0.59	144	0.4387	0.0395	0.537	.....	92,365	44,545
	0.60 to 0.69	17	0.4461	0.0387	0.618	.....	96,218	47,738

TABLE VII.—*Effect of Manganese upon Acid Steel.*

Carbon.	Manganese.										
	Per Cent. 0.40	Per Cent. 0.42	Per Cent. 0.44	Per Cent. 0.46	Per Cent. 0.48	Per Cent. 0.50	Per Cent. 0.52	Per Cent. 0.54	Per Cent. 0.56	Per Cent. 0.58	Per Cent. 0.60
Per Cent.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.
0.10	160	320	480	640	800	960	1,120	1,280	1,440	1,600	
0.15	240	480	720	960	1,200	1,440	1,680	1,920	2,160	2,400	
0.20	320	640	960	1,280	1,600	1,920	2,240	2,560	2,880	3,200	
0.25	400	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	
0.30	480	960	1,440	1,920	2,400	2,880	3,360	3,840	4,320	4,800	
0.35	560	1,120	1,680	2,240	2,800	3,360	3,920	4,480	5,040	5,600	
0.40	640	1,280	1,920	2,560	3,200	3,840	4,480	5,120	5,760	6,400	
0.45	720	1,440	2,160	2,880	3,600	4,320	5,040	5,760	6,480	7,200	
0.50	800	1,600	2,400	3,200	4,0 0	4,800	5,600	6,400	7,200	8,000	
0.55	880	1,760	2,640	3,520	4,400	5,280	6,160	7,040	7,920	8,800	
0.60	960	1,920	2,880	3,840	4,800	5,760	6,720	7,680	8,640	9,600	

TABLE VIII.—*Division of Heats to Determine the Effect of Sulphur on Acid Steel.*

NOTE.—In the eighth column both carbon and phosphorus are valued at 1,000 lb. for 0.01 per cent.; the figure for manganese is taken from Table VII.

Limits of Carbon.	Relative Sulphur.	Chemical Composition.				Ultimate Strength.			Number of Heats.	Product of Last Two Columns.
		Carbon.	Phosphorus.	Manganese.	Sulphur.	Actual Records.	Difference Due to Sulphur Alone.	Effect of 0.01 Per Cent. of Sulphur.		
Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. In.	Pounds per Sq. In.	Pounds per Sq. In.		
0.075 to 0.124	High.	0.1154	0.0587	0.424	0.0657	58,860	.....	.....	.....	.....
	Low..	0.1079	0.0501	0.390	0.0523	57,093	.....	.....	.....	.....
	Diff...	0.0075	0.0086	0.034	0.0134	1,767	−143	−107	50	−5,350
0.125 to 0.174	High.	0.1467	0.0600	0.439	0.0640	61,582	.....	.....	.....	.....
	Low..	0.1485	0.0526	0.435	0.0509	60,398	.....	.....	.....	.....
	Diff...	0.0018	0.0074	0.004	0.0131	1,184	+576	+440	131	+57,640
0.175 to 0.224	High.	0.2001	0.0604	0.488	0.0628	67,482	.....	.....	.....	.....
	Low..	0.1987	0.0553	0.462	0.0490	66,181	.....	.....	.....	.....
	Diff...	0.0014	0.0051	0.026	0.0138	1,301	+235	+170	58	+9,860
0.225 to 0.274	High.	0.2490	0.0596	0.486	0.0576	70,925	.....	.....	.....	.....
	Low..	0.2435	0.0530	0.483	0.0488	70,550	.....	.....	.....	.....
	Diff...	0.0055	0.0066	0.003	0.0088	375	−895	−1,017	22	−22,374
0.275 to 0.324	High.	0.3067	0.0526	0.538	0.0597	79,650	.....	.....	.....	.....
	Low..	0.3062	0.0419	0.517	0.0475	78,363	.....	.....	.....	.....
	Diff...	0.0005	0.0107	0.021	0.0122	1,287	−337	−276	50	−13,800
0.325 to 0.374	High.	0.3499	0.0496	0.546	0.0574	83,526	.....	.....	.....	.....
	Low..	0.3503	0.0432	0.527	0.0460	82,615	.....	.....	.....	.....
	Diff...	0.0004	0.0064	0.019	0.0114	911	−321	−194	120	−23,280
0.375 to 0.424	High.	0.3993	0.0437	0.527	0.0543	87,475	.....	.....	.....	.....
	Low..	0.4007	0.0363	0.509	0.0424	86,830	.....	.....	.....	.....
	Diff...	0.0014	0.0074	0.018	0.0119	645	−531	−446	103	−45,938
0.425 to 0.474	High.	0.4522	0.0418	0.529	0.0551	93,721	.....	.....	.....	.....
	Low..	0.4462	0.0336	0.512	0.0413	92,082	.....	.....	.....	.....
	Diff...	0.0060	0.0082	0.017	0.0138	1,639	−393	−285	86	−24,510
0.475 to 0.524	High.	0.4944	0.0380	0.518	0.0519	97,911	.....	.....	.....	.....
	Low..	0.4975	0.0347	0.520	0.0426	98,536	.....	.....	.....	.....
	Diff...	0.0031	0.0033	0.002	0.0093	−625	−565	−608	43	−25,536
0.525 to 0.574	High.	0.5421	0.0405	0.500	0.0510	103,665	.....	.....	.....	.....
	Low..	0.5517	0.0302	0.490	0.0422	101,027	.....	.....	.....	.....
	Diff...	0.0096	0.0103	0.010	0.0088	2,638	+2,128	+2,416	8	+19,344
0.575 to 0.624	High.	0.5897	0.0300	0.507	0.0503	108,550	.....	.....	.....	.....
	Low..	0.5827	0.0360	0.480	0.0417	106,245	.....	.....	.....	.....
	Diff...	0.0070	0.0060	0.027	0.0086	2,305	+952	+1,107	6	+6,642
Total.....									676	−67,302
Average.....										−100

ganese above 0.4 per cent. is accompanied by an increase in strength, but this increase is not the same with steels of different carbon. In steels containing more than 0.374 per cent. of carbon each increase of 0.01 per cent. of manganese augments the tensile strength by about 440 pounds per square inch. In Table VI it is shown that

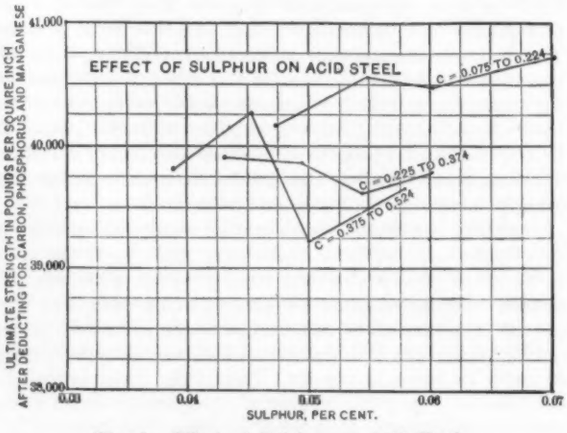


Fig. 4.—Effect of Sulphur on Acid Steel.

the average carbon of this group is about 0.44 per cent., and we thus determine that for a steel of 0.44 per cent. of carbon the strengthening effect of 0.01 per cent. of manganese is about 440 pounds per square inch. In the same way the line of next lower carbon shows that in steels of 0.33 per cent. of carbon the strengthening effect is about 260 pounds per square inch. The next three lines may be considered as a unit indicating that for steels of 0.155 per cent. of carbon the strengthening effect is about 125 pounds per square inch. Plotting these data it was found that the strengthening effect of each

TABLE IX.—*Classification of Acid Heats According to Content of Sulphur.*

NOTE.—In the last column a value of 1,000 lb. is given to 0.01 per cent. of both carbon and phosphorus; the figure for manganese is taken from Table VII.

Limits of Carbon.	Number of Heats.	Chemical Composition.				Ultimate Strength.	
		Carbon.	Phosphorus.	Manganese.	Sulphur.	Actual Records.	After Deducting for Carbon, Phosphorus and Manganese.
Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch.
0.075 to 0.224	58	0.1601	0.0519	0.425	0.0474	61,689	40,169
	68	0.1457	0.0546	0.444	0.0547	61,097	40,561
	61	0.1551	0.0581	0.448	0.0602	62,376	40,486
	52	0.1474	0.0621	0.444	0.0703	62,195	40,717
0.225 to 0.374	44	0.3345	0.0401	0.518	0.0431	80,478	39,903
	37	0.3288	0.0470	0.527	0.0495	80,798	39,865
	60	0.3256	0.0499	0.533	0.0544	80,670	39,609
	51	0.3203	0.0532	0.535	0.0612	80,582	39,776
0.375 to 0.524	63	0.4356	0.0330	0.514	0.0389	90,689	39,816
	45	0.4419	0.0367	0.511	0.0454	92,041	40,274
	64	0.4378	0.0392	0.515	0.0500	90,988	39,240
	59	0.4290	0.0449	0.536	0.0579	91,726	39,658

0.01 per cent. of manganese above a content of 0.4 per cent. is 80 pounds per square inch for a steel of 0.1 per cent. of carbon, but that for each rise of 0.01 per cent. of carbon the strengthening effect is increased 8 pounds. Thus an increase in manganese from 0.4 to 0.41 per cent. in steel of 0.1 per cent. of carbon raises the strength 80 pounds, but an increase in manganese from 0.4 to 0.41 per cent. in steel of 0.11 per cent. of carbon raises the strength 88 pounds. A continuation of the line thus plotted gave zero effect for zero carbon. With basic steel it will appear that a different value was obtained for a starting point and a different value for the increment. The law of variation in the effect of manganese upon acid steels is shown in Table VII.

Effect of Sulphur on Acid Steel.

First Method.—The heats were divided into high and low sulphur, as shown in Table VIII, following the same system as used with manganese and phosphorus. The results give a value of minus 100 pounds for 0.01 per cent. of sulphur, indicating that 0.01 per cent. weakens the steel by 100 pounds per square inch.

Second Method.—The heats were classified according to their sulphur content, the results being shown in Table IX and in Fig. 4. The second method corroborates the

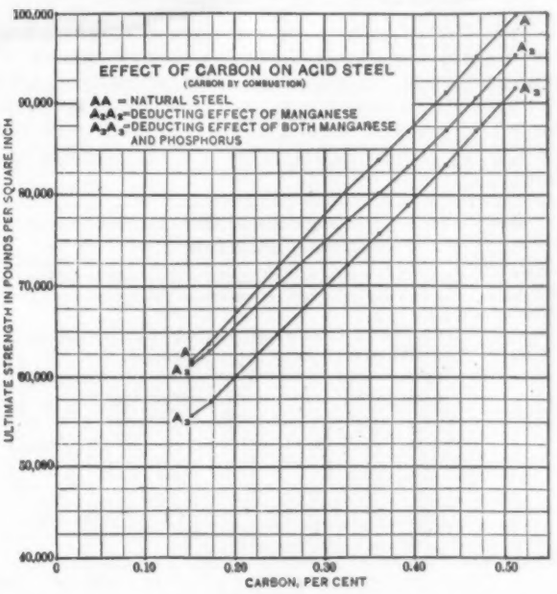


Fig. 5.—Effect of Carbon on Acid Steel (Carbon by Combustion).

first in showing that sulphur has little influence upon the strength of acid steel.

Effect of Carbon on Acid Steel.

Having found the effect of manganese and phosphorus, it becomes possible to correct the original line so as to determine the value of carbon. It so happens that the heats of higher carbon are at the same time of higher manganese. This makes a double correction, as

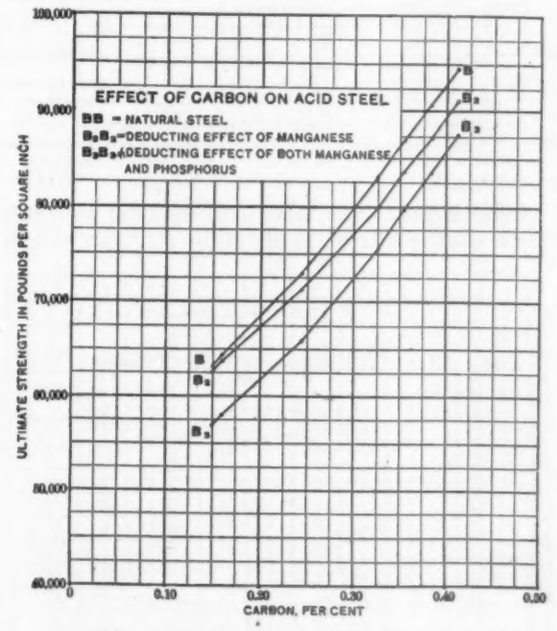


Fig. 6.—Effect of Carbon on Acid Steel (Carbon by Color).

an allowance must be made for the greater amount of manganese and for the greater effect of this element in steels of higher carbon. The allowances are made in accordance with Table VII. The result is to drop the upper end of the line more than the lower and thereby decrease the angle which the line makes with the horizontal, this angle measuring the effect of carbon.

In allowing for phosphorus very little change is made in this angle, as the proportion of phosphorus is nearly the same in the low and in the high carbon steels, but the whole line is lowered, thereby giving a lower value for the point where the prolongation of the line intersects the ordinate of zero carbon. Table X gives the corrected values, which are plotted in Figs. 5 and 6. The lines A A and B B are copied from Fig. 1; the lines A_2 A_2 and B_2 B_2 represent the allowance for manganese, and the lines A_3 A_3 and B_3 B_3 are corrected for both manganese and phosphorus. The line A_3 A_3 indicates a value of 1000 pounds for each 0.01 per cent. carbon when the combustion method is used, and it intersects the zero ordinate at 40,000 pounds. The line B_3 B_3 indicates a value of 1140 pounds for each 0.01 per cent. of carbon when the color method is used, and it intersects the zero ordinate at 39,800 pounds.

TABLE X.—*Effect of Carbon upon Acid Steel.*

NOTE.—In calculating the last column a value of 1,000 lb. is given to 0.01 per cent. of phosphorus; manganese is rated according to Table VII.

Class.	Chemical Composition.			Ultimate Strength.	
	Carbon.	Phosphorus.	Manganese.	Actual Records.	After Deducting for Phosphorus and Manganese.
	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch.
Acid test-bars; carbon by combustion.	0.1620	0.0565	0.440	61,806	55,676
	0.1713	0.0570	0.453	63,637	57,216
	0.2486	0.0537	0.497	72,185	64,875
	0.3268	0.0480	0.529	80,626	72,472
	0.3609	0.0443	0.528	83,886	75,744
	0.3943	0.0419	0.526	87,155	78,996
	0.4357	0.0384	0.519	91,278	83,273
	0.4693	0.0371	0.518	95,052	86,917
	0.5130	0.0358	0.513	99,795	91,605
Acid test-bars; carbon by color.	0.1489	0.0562	0.443	63,072	56,936
	0.1600	0.0564	0.453	64,379	58,061
	0.2437	0.0541	0.491	72,980	65,823
	0.3255	0.0434	0.519	83,168	75,686
	0.3534	0.0403	0.515	87,012	79,762
	0.3827	0.0364	0.513	90,742	83,667
	0.4112	0.0351	0.506	94,689	87,702

Effect of Manganese on Basic Steel.

First Method.—The bars were divided into high and low manganese, as shown in Table XI. The figures show an increasing value for manganese as the carbon increases, thereby agreeing with the work on acid steel. In the first group, composed of heats of very soft steel, the value of manganese is practically zero. This is the same thing as saying that the decrease in manganese content from 0.408 per cent. to 0.118 per cent. did not decrease the strength, which is entirely in accord with the theory before advanced that oxide of iron strengthens steel.

Second Method.—The bars were classified according to their content of manganese, as shown in Table XII and in Fig. 7. The line of very low carbon and low

TABLE XI.—*Division of Heats to Determine the Effect of Manganese upon Basic Steel.*

NOTE.—In the eighth column a value of 770 lb. is given to 0.01 per cent. of carbon, and 1,000 lb. to 0.01 per cent. of phosphorus.

Limits of Carbon.	Relative Manganese.	Number of Heats.	Chemical Composition.			Ultimate Strength		
			Carbon.	Phosphorus.	Manganese.	Actual Records.	Difference Due to Manganese Alone.	Effect of 0.01 Per Cent. of Manganese.
Per Cent.			Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
0.020 to 0.074	High.	58	0.0622	0.0094	0.408	48,152	.....	.....
	Low..	77	0.0322	0.0073	0.118	45,669	.....	.....
			0.0300	0.0021	0.290	2,483	—37	—1
0.075 to 0.124	High.	64	0.0968	0.0086	0.485	50,726	.....	.....
	Low..	61	0.0980	0.0083	0.357	49,445	.....	.....
			0.0012	0.0003	0.128	1,281	1,177	92
0.125 to 0.174	High.	68	0.1555	0.0121	0.497	56,680	.....	.....
	Low..	66	0.1488	0.0112	0.374	54,887	.....	.....
			0.0067	0.0009	0.123	1,793	1,003	82
0.175 to 0.224	High.	120	0.2049	0.0130	0.535	62,370	.....	.....
	Low..	126	0.2040	0.0097	0.411	60,162	.....	.....
			0.0009	0.0033	0.124	2,208	1,598	129
0.225 to 0.274	High.	128	0.2495	0.0123	0.532	67,058	.....	.....
	Low..	135	0.2474	0.0098	0.415	62,528	.....	.....
			0.0021	0.0025	0.117	4,530	3,896	333
0.275 to 0.324	High.	60	0.2907	0.0123	0.525	69,593	.....	.....
	Low..	65	0.2960	0.0090	0.408	67,144	.....	.....
			0.0053	0.0033	0.117	2,449	2,286	195
0.325 to 0.374	High.	14	0.3414	0.0099	0.516	73,116	.....	.....
	Low..	13	0.3411	0.0126	0.401	70,932	.....	.....
			0.0003	0.0027	0.115	2,184	2,171	189
0.375 to 0.424	High.	6	0.3938	0.0150	0.583	82,695	.....	.....
	Low..	5	0.3924	0.0080	0.398	73,741	.....	.....
			0.0014	0.0070	0.185	8,954	7,691	416

manganese steels shows that in the absence of manganese the strength is raised by iron oxide or by some other agent. In steels of higher carbon less oxygen is present owing to the protecting power of carbon, and the decrease in strength with decrease in manganese holds

good down to a content of 0.3 per cent. Considering only the lines representing steels with from 0.075 to 0.224 per cent. and with from 0.225 to 0.374 per cent. of carbon, and pursuing the same course of reasoning as explained in the valuation of manganese in acid steels, it appears that above the limit of 0.3 per cent. of manganese the effect of each unit of that element is greater in the steels of higher carbon. In the acid steel the value at zero carbon was zero; the effect of 0.01 per cent. of manganese in a steel of 0.1 per cent. of carbon was 80 pounds, and this effect increased 8 pounds with each rise of 0.01 per cent. of carbon.

TABLE XII.—*Classification of Basic Heats According to Content of Manganese.*

NOTE.—In the last column a value of 770 lb. is given to 0.01 per cent. of carbon, and 1,000 lb. to 0.01 per cent. of phosphorus.

Limits of Carbon.	Limits of Manganese.	Number of Heats.	Chemical Composition.			Ultimate Strength.	
			Carbon.	Phosphorus.	Manganese.	Actual Records.	After Deducting for Carbon and Phosphorus.
Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
Below 0.075	0.05 to 0.09	12	0.0297	0.0075	0.081	45,803	42,766
	0.10 to 0.14	56	0.0327	0.0073	0.120	45,674	42,426
	0.15 to 0.29	13	0.0388	0.0072	0.191	45,961	42,254
	0.30 to 0.39	16	0.0608	0.0097	0.354	48,034	42,390
	0.40 to 0.49	34	0.0632	0.0091	0.438	47,981	42,205
	0.50 to 0.59	4	0.0663	0.0133	0.508	51,133	44,698
0.075 to 0.224	0.20 to 0.29	7	0.1103	0.0079	0.259	50,056	40,773
	0.30 to 0.39	114	0.1458	0.0098	0.363	54,110	41,904
	0.40 to 0.49	242	0.1668	0.0099	0.441	57,036	43,203
	0.50 to 0.59	110	0.1744	0.0125	0.531	59,316	44,638
	0.60 to 0.69	26	0.1887	0.0154	0.622	61,862	45,793
0.225 to 0.374	0.30 to 0.39	61	0.2678	0.0089	0.365	63,858	42,349
	0.40 to 0.49	221	0.2689	0 0101	0.446	65,949	44,236
	0.50 to 0.59	102	0.2668	0.0130	0.532	67,565	45,723
	0.60 to 0.69	28	0.2695	0.0139	0.624	69,467	47,327

TABLE XIII.—*Effect of Manganese upon Basic Steel.*

Carbon.	Manganese.						
	Per Cent. 0.30	Per Cent. 0.35	Per Cent. 0.40	Per Cent. 0.45	Per Cent. 0.50	Per Cent. 0.55	Per Cent. 0.60
Per Cent.		Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
0.05	.....	550	1,100	1,650	2,200	2,750	3,300
0.10	.....	650	1,300	1,950	2,600	3,250	3,900
0.15	.....	750	1,500	2,250	3,000	3,750	4,500
0.20	.....	850	1,700	2,550	3,400	4,250	5,100
0.25	.....	950	1,900	2,850	3,800	4,750	5,700
0.30	.....	1,050	2,100	3,150	4,200	5,250	6,300
0.35	.....	1,150	2,300	3,450	4,600	5,750	6,900
0.40	.....	1,250	2,500	3,750	5,000	6,250	7,500

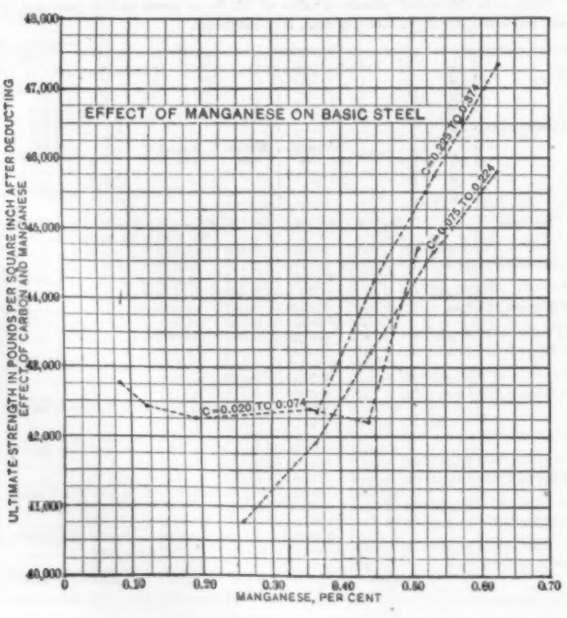


Fig. 7.—Effect of Manganese on Basic Steel.

per cent. of manganese is 130 pounds, and the increase in effect due to a rise of 0.01 per cent. of carbon is only 4 pounds. In the acid steel the base is 0.4 per cent. manganese; in the basic steel it is 0.3 per cent. The results are tabulated in Table XIII.

Effect of Sulphur Upon Basic Steel.

First Method.—The heats were divided into high and low sulphur, as shown in Table XIV, and the results indicate that 0.01 per cent. of sulphur strengthens steel by 58 pounds per square inch. In the acid steel the same method of analysis showed a weakening effect of 100 pounds. In either case the value is too small to be important.

TABLE XIV.—*Division of Heats to Determine the Effect of Sulphur on Basic Steel.*

NOTE.—In the eighth column a value of 770 lb. is given to 0.01 per cent. of carbon, and 1,000 lb. to 0.01 per cent. of phosphorus; manganese is rated as shown in Table XIII.

Limits of Carbon.	Relative Sulphur	Chemical Composition.				Ultimate Strength			Number of Heats.	Product of Last Two Columns.
		Carbon	Phosphorus.	Manganese.	Sulphur	Actual Records.	Difference Due to Sulphur Alone.	Effect of 0.01 Per Cent. of Sulphur.		
Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.		
0.020 to 0.074	High.	0.0545	0.0091	0.323	0.0353	47,512	.....	.....	.....	.....
	Low..	0.0361	0.0074	0.166	0.0240	46,000	.....	*Note	...	.....
	Diff..	0.0184	0.0017	0.157	0.0113	1,512	—74	—65	135	—8,775
0.075 to 0.124	High.	0.1012	0.0088	0.417	0.0452	51,070	.....	.....	.....	.....
	Low..	0.0936	0.0081	0.428	0.0267	49,116	.....	.....	.....	.....
	Diff..	0.0076	0.0007	0.011	0.0185	1,954	+1,442	+779	125	+97,375
0.125 to 0.174	High.	0.1505	0.0133	0.428	0.0563	56,196	.....	.....	.....	.....
	Low..	0.1540	0.0099	0.446	0.0342	55,394	.....	.....	.....	.....
	Diff..	0.0035	0.0034	0.018	0.0221	802	+1,002	+453	133	+60,250
0.175 to 0.224	High.	0.2038	0.0124	0.479	0.0553	61,236	.....	.....	.....	.....
	Low..	0.2050	0.0104	0.465	0.0356	61,247	.....	.....	.....	.....
	Diff..	0.0012	0.0020	0.014	0.0197	—11	—357	—181	246	—44,522
0.225 to 0.274	High.	0.2475	0.0132	0.487	0.0517	65,016	.....	.....	.....	.....
	Low..	0.2493	0.0089	0.457	0.0331	64,452	.....	.....	.....	.....
	Diff..	0.0018	0.0043	0.030	0.0186	564	—297	—160	263	—42,080
0.275 to 0.324	High.	0.2922	0.0120	0.477	0.0447	68,771	.....	.....	.....	.....
	Low..	0.2947	0.0092	0.451	0.0323	67,875	.....	.....	.....	.....
	Diff..	0.0025	0.0028	0.026	0.0124	896	+273	+220	125	+27,500
0.325 to 0.374	High.	0.3386	0.0128	0.450	0.0414	71,525	.....	.....	.....	.....
	Low..	0.3441	0.0093	0.472	0.0294	72,647	.....	.....	...	.....
	Diff..	0.0055	0.0035	0.022	0.0120	—1,122	—551	—459	27	—12,392
0.375 to 0.424	High.	0.3950	0.0145	0.497	0.0397	78,400	.....	.....	.....	.....
	Low..	0.3910	0.0086	0.502	0.0308	78,895	.....	.....	.....	.....
	Diff..	0.0040	0.0059	0.005	0.0089	—495	—1,270	—1,427	11	—15,697
Total									1,065	+61,659
Average										+58

*NOTE.—In calculating the difference due to sulphur in the group of very low carbon steels, no allowance is made for the difference in manganese, as a decrease in manganese to a content of 0.166 per cent. is not necessarily followed by a decrease in strength.

Second Method.—The heats were classified according to their sulphur content, as shown in Table XV and in Fig. 8. The lines are irregular and indeterminate, indicating a very small value for this element.

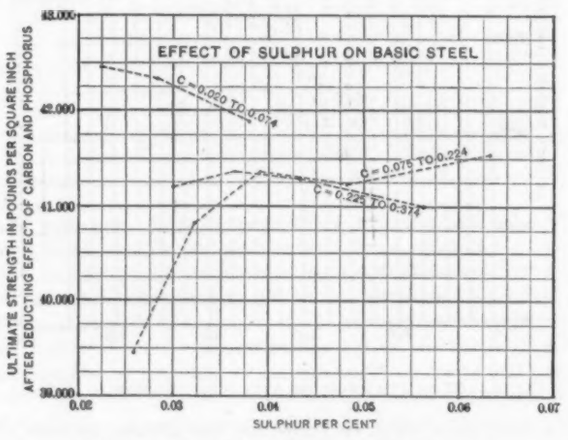


Fig. 8.—Effect of Sulphur on Basic Steel.

Effect of Carbon Upon Basic Steel.

The effect of carbon was found, as in the case of acid steels, by allowing for phosphorus and manganese in the groups given in Table II. The data are given in Table XVI and in Figs. 9 and 10. The line $D_2 D_3$ indicates a value of 770 pounds for each 0.01 per cent. of carbon when the combustion method is used, and it intersects the zero ordinate at 41,500 pounds.

The line $E_2 E_3$ indicates a value of 820 pounds for

each 0.01 per cent. of carbon when the color method is used, and it intersects the zero ordinate at 42,000 pounds.

It has already been explained, and is shown by Fig. 9, that any change in the value of manganese affects the tangent of the carbon line, thereby affecting the value

TABLE XV.—*Classification of Basic Heats According to Content of Sulphur.*

NOTE.—In the last column a value of 770 lb. is given to 0.01 per cent. of carbon, and 1,000 lb. to 0.01 per cent. of phosphorus; manganese is rated as shown in Table XIII.

Limits of Carbon.	Number of Heats.	Chemical Composition.				Ultimate Strength.	
		Carbon.	Phosphorus.	Manganese.	Sulphur	Actual Records.	After Deducting for Carbon, Phosphorus and Manganese.
Per Cent.		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch.
Below 0.075	45	0.0361	0.0074	0.162	0.0225	45,978	42,458
	46	0.0418	0.0077	0.212	0.0283	46,337	42,348
	44	0.0575	0.0096	0.356	0.0380	47,922	41,896
0.075 to 0.224	74	0.1225	0.0078	0.434	0.0258	51,524	39,462
	103	0.1571	0.0089	0.444	0.0322	56,027	40,822
	112	0.1786	0.0114	0.466	0.0391	58,944	41,363
	105	0.1790	0.0115	0.461	0.0482	58,767	41,226
	110	0.1696	0.0129	0.441	0.0632	58,129	41,552
0.225 to 0.374	115	0.2754	0.0083	0.453	0.0298	66,333	41,206
	113	0.2693	0.0097	0.458	0.0365	66,194	41,360
	89	0.2679	0.0114	0.464	0.0434	66,307	41,292
	98	0.2582	0.0149	0.504	0.0563	66,334	41,005

TABLE XVI.—*Effect of Carbon upon Basic Steel.*

NOTE.—In calculating the last column a value of 1,000 lb. is given to 0.01 per cent. of phosphorus; the manganese is rated as shown in Table XIII.

Class.	Chemical Composition.			Ultimate Strength.	
	Carbon.	Phosphorus.	Manganese.	Actual Records.	After Deducting for Phosphoras and Manganese.
	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch
Basic test-bars; carbon by combustion.	0.0978	0.0094	0.366	50,834	49,036
	0.1639	0.0107	0.450	57,001	53,621
	0.2115	0.0113	0.465	61,502	57,501
	0.2403	0.0110	0.471	64,086	59,805
	0.2681	0.0109	0.470	66,297	61,841
	0.3081	0.0108	0.466	69,626	64,994
	0.3582	0.0113	0.469	74,203	69,118
Basic-test bars; carbon by color	0.1010	0.0101	0.384	52,540	50,438
	0.1688	0.0116	0.458	59,739	56,083
	0.2036	0.0118	0.466	62,750	58,748
	0.2260	0.0118	0.468	64,839	60,601
	0.2564	0.0117	0.469	66,830	62,381

found for a unit of that element; and as manganese has been given a slightly higher value in basic than in acid steel, it would naturally follow that the result for carbon would be lower in the basic than in the acid

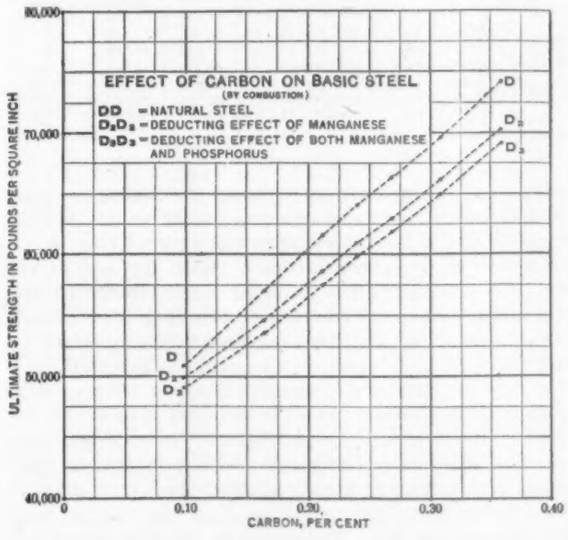


Fig. 9.—Effect of Carbon on Basic Steel (Carbon by Combustion).

steel. To find how much this change in the value of manganese affected the carbon determination the experiment was tried of correcting the line of basic according to the values of manganese found for acid steel. The result showed a value of 810 pounds for 0.01 per cent. of carbon instead of 770 pounds, as found by the above special investigation. Inasmuch as the acid steel gave a value for carbon of 1000 pounds per unit of 0.01 per cent., and as the basic steel gives 810 pounds when calculated by the acid formula and 770 pounds by its own formula, it would seem certain that a unit of carbon has much less effect upon basic than upon acid steel.

The Application of the Formulæ.

Table XVII shows the result of comparing the actual strength of the steels under consideration with the strength as calculated from the formulæ just given. For this purpose the heats were grouped according to carbon and then subdivided according to manganese. No heats were put together that varied more than 0.05 per cent. in carbon or more than 0.1 per cent. in man-

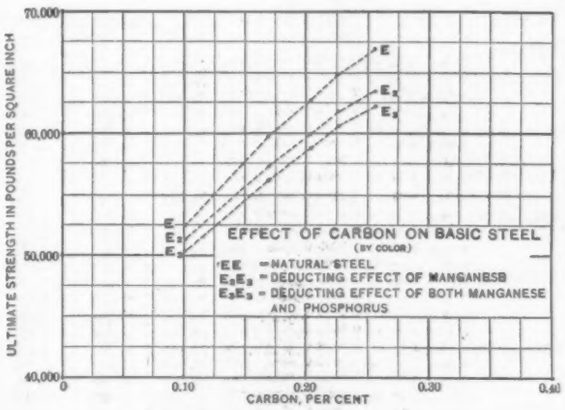


Fig. 10.—Effect of Carbon on Basic Steel (Carbon by Color).

ganese. For instance, a group might include a heat containing 0.1 per cent of carbon and 0.3 per cent. of manganese, and another heat containing 0.149 per cent. of carbon and 0.399 per cent. of manganese, but any heat of higher or lower carbon or of higher or lower manganese than these extremes would fall into another group. Inasmuch as the phosphorus did not vary through wide limits in any of the steels, each group may be looked upon as composed of heats that are practically alike in chemical composition, and which may properly be averaged to eliminate accidental errors.

In some of the subdivisions the number of heats is so small that these errors cloud the result. Especially in the steels of higher carbon it is desirable to have a large number of heats in the average, as it is difficult to get uniform results on a testing machine under usual working conditions when the bar has a strength of over 90,000 pounds per square inch, and, unfortunately, it is in these high steels, and particularly in the groups with an unusual content of manganese, that only a small number of heats were on record. There are accordingly several instances where these small groups show a considerable difference between the actual and the calculated strength, but there seems to be no rule as to the difference, as other groups, either large or small, of the same class of steels give satisfactory results.

It is, of course, a matter of opinion as to what constitutes a fair agreement between the actual and calculated strengths, but in the following comparison it will be assumed that the results of the formulæ should be within 1500 pounds of the records of the testing machine. In the acid steels there are 12 groups containing less than five heats each. In seven of these the calculated strength agrees with the actual strength within 1500 pounds. In five groups the difference is over 1500 pounds. In the basic steel there are 17 groups containing less than 5 heats, and 9 of these agree within 1500 pounds. Eight groups show a difference greater than this amount. Taking both acid and basic steels, out of 29 "small" groups 16 are correct, and of the 13 that are beyond the limit 9 are single heats, most of them being steel of moderately high carbon.

In the acid steel there are 23 groups containing over 4 heats each, and all of them are within the limit of

1500 pounds, only 5 having an error of over 1000 pounds. In the basic steel there are 26 groups with over 4 heats and 25 are within 1500 pounds and 17 within 1000 pounds. There is 1 group of 53 heats, averaging about 0.1 per cent. of carbon, which shows an error of + 1810 pounds. Putting aside mathematical errors, which can hardly be present in this investigation (owing to repeated checking of the totals at each separate rearrangement), it may appear probable that this group contains some abnormal bars, and it may also appear possible that some of the other large groups show an agreement through the averaging of bars showing wide differences among themselves.

Table XVIII gives some information on this point. Every group in Table XVII comprising more than 50 heats and containing less than 0.225 per cent. of carbon is subdivided so as to have only one-half the former variation in manganese. Thus, if a group comprised heats ranging from 0.4 to 0.49 per cent. of manganese, it is subdivided into one group ranging from 0.4 to 0.44 per cent., and another from 0.45 to 0.49 per cent. If the original group were an average of unlike units, it is probable that the fact would be made manifest by a wide difference between the two parts, but in no case is such a difference discernible.

In the case of the one group of 53 heats, before mentioned, a more extended analysis is given in the table. It has been divided into ten parts, the first containing only those heats that contained 0.4 per cent. of manganese, the second those with 0.41 per cent. of manganese, and so on. The number of heats in some of the subdivisions is small, and complete regularity could hardly be expected, but in these ten subdivisions the smallest difference between the strength as calculated by the formula and the strength as found by the testing machine is + 723 pounds, and the greatest is + 2729 pounds, so that the deviation of this group from the general rule is not due to one or two abnormal bars. With this one exception, the cause of which remains unexplained, all the large groups show a difference of less than 1500 pounds between the actual and the calculated strength, which is, perhaps, as close an agreement as could be expected.

A careful analysis was made to discover whether anything could be learned from the so-called errors. If, for instance, the groups of low carbon had shown a considerable and uniform minus error and the groups of high carbon had uniformly shown similar plus error, then it would be probable that the value of carbon was too high and the base too low. Investigation failed to show any regular law either for groups of high and low carbon or for groups of high and low manganese. The one fact which appears to be true of both acid and of basic steel is that the steels that are low in carbon and low in manganese are stronger than would be called for by the formula, and it seems probable that this is due to oxide of iron.

Table XVII.—*Comparison of the Actual Ultimate Strength of Certain Groups of Steel with the Strength as Calculated from the Following Formulæ:*

Acid steel: 40,000 + 1,000 C + 1,000 P + z Mn = ultimate strength.
Basic steel: 41,500 + 770 C + 1,000 P + y Mn = ultimate strength.

Value of z as per Table VII; value of y as per Table XIII.

Heavy type denote that the difference between the actual and calculated strengths is over 1,500 pounds.

Limits of Carbon.	Limits of Manganese.	Number of Heats.	Chemical Composition.			Ultimate Strength.		
			Carbon.	Phosphorus.	Manganese.	Actual Records.	By Formula.	Difference.
Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
Acid steel:								
0.075 to 0.124	0.30 to 0.39	18	0.1095	0.0517	0.361	57,217	56,120	—1,097
	0.40 to 0.49	31	0.1131	0.0566	0.432	58,414	57,258	—1,156
	0.50 to 0.59	1	0.1130	0.0440	0.500	56,745	56,600	—145
0.125 to 0.174	0.30 to 0.39	21	0.1352	0.0542	0.377	59,285	58,940	—345
	0.40 to 0.49	96	0.1466	0.0567	0.440	60,954	60,794	—160
	0.50 to 0.59	14	0.1608	0.0601	0.513	64,253	63,536	—717
0.175 to 0.224	0.40 to 0.49	39	0.2011	0.0577	0.449	66,698	66,664	—34
	0.50 to 0.59	19	0.1960	0.0579	0.527	67,035	67,371	+336
0.225 to 0.274	0.30 to 0.39	1	0.2340	0.0550	0.390	68,460	68,900	+440
	0.40 to 0.49	11	0.2520	0.0576	0.462	71,068	72,200	+1,132
	0.50 to 0.59	10	0.2413	0.0551	0.519	70,602	71,925	+1,323
0.275 to 0.324	0.40 to 0.49	14	0.3093	0.0446	0.469	78,200	77,101	—1,099
	0.50 to 0.59	32	0.3066	0.0485	0.541	79,167	78,950	—217
	0.60 to 0.69	3	0.2863	0.0497	0.613	80,223	78,456	—1,767
	0.70 to 0.79	1	0.3240	0.0580	0.720	84,100	86,320	+2,220
0.325 to 0.374	0.30 to 0.39	1	0.3490	0.0340	0.300	81,650	78,300	—3,350
	0.40 to 0.49	22	0.3452	0.0446	0.455	80,208	80,498	+290
	0.50 to 0.59	80	0.3512	0.0472	0.544	83,425	83,872	+447
	0.60 to 0.69	16	0.3516	0.0472	0.619	85,258	86,012	+754
	0.70 to 0.79	1	0.3440	0.0450	0.700	86,840	87,180	+340
0.375 to 0.424	0.40 to 0.49	34	0.4009	0.0377	0.464	85,205	85,908	+703
	0.50 to 0.59	63	0.3996	0.0410	0.537	87,880	88,444	+564
	0.60 to 0.69	6	0.3993	0.0425	0.622	90,598	91,284	+686
0.425 to 0.474	0.40 to 0.49	27	0.4481	0.0363	0.462	90,950	90,672	—278
	0.50 to 0.59	53	0.4515	0.0382	0.539	93,760	93,974	+214
	0.60 to 0.69	6	0.4332	0.0378	0.617	93,805	94,587	+782
0.475 to 0.524	0.30 to 0.39	1	0.4770	0.0330	0.380	90,775	91,000	+225
	0.40 to 0.49	12	0.4955	0.0340	0.468	95,745	95,643	—102
	0.50 to 0.59	25	0.4961	0.0376	0.533	98,699	98,637	—62
	0.60 to 0.69	4	0.5010	0.0365	0.617	104,550	102,430	—2,120
0.525 to 0.574	0.40 to 0.49	6	0.5463	0.0303	0.478	100,718	101,061	+343
	0.50 to 0.59	2	0.5490	0.0505	0.545	107,230	106,330	—900
0.575 to 0.624	0.40 to 0.49	4	0.5887	0.0312	0.462	105,131	104,904	—227
	0.50 to 0.59	1	0.5770	0.0430	0.510	112,760	107,071	—5,689
	0.60 to 0.69	1	0.5850	0.0300	0.600	111,100	110,860	—240
Basic steel:								
0.020 to 0.074	0.00 to 0.09	12	0.0297	0.0075	0.081	45,803	44,537	—1,266
	0.10 to 0.19	65	0.0326	0.0073	0.125	45,645	44,740	—905
	0.20 to 0.29	4	0.0543	0.0073	0.263	47,094	46,411	—683
	0.30 to 0.39	16	0.0608	0.0097	0.354	48,034	47,767	—267
	0.40 to 0.49	34	0.0632	0.0091	0.438	47,981	48,849	+868
	0.50 to 0.59	4	0.0663	0.0133	0.508	51,133	50,389	—744
0.075 to 0.124	0.10 to 0.19	1	0.0990	0.0080	0.160	45,780	49,923	+4,143
	0.20 to 0.29	6	0.0993	0.0078	0.262	49,378	49,926	+548
	0.30 to 0.39	42	0.0983	0.0086	0.363	49,683	50,748	+1,065
	0.40 to 0.49	53	0.0955	0.0083	0.438	49,667	51,477	+1,810
	0.50 to 0.59	21	0.0998	0.0089	0.539	51,900	53,182	+1,282
	0.60 to 0.69	2	0.0950	0.0085	0.660	55,773	54,345	—1,428
0.125 to 0.174	0.10 to 0.19	1	0.1370	0.0070	0.160	52,295	52,749	+454
	0.30 to 0.39	41	0.1486	0.0107	0.359	54,738	54,897	+159
	0.40 to 0.49	64	0.1531	0.0114	0.445	55,800	56,596	+796
	0.50 to 0.59	24	0.1549	0.0130	0.535	57,050	58,300	+1,250
	0.60 to 0.69	3	0.1657	0.0213	0.640	59,943	61,693	+1,750
0.175 to 0.224	0.20 to 0.29	1	0.1760	0.0080	0.240	54,120	55,852	+1,732
	0.30 to 0.39	31	0.2064	0.0104	0.367	59,276	59,611	+335
	0.40 to 0.49	125	0.2040	0.0098	0.441	60,752	60,670	—82
	0.50 to 0.59	65	0.2059	0.0135	0.527	62,547	62,698	+151
	0.60 to 0.69	21	0.2009	0.0152	0.616	62,716	63,987	+1,271
	0.70 to 0.79	3	0.2050	0.0087	0.713	65,507	65,424	—83
0.225 to 0.274	0.20 to 0.29	1	0.2300	0.0070	0.260	61,090	59,909	—1,181
	0.30 to 0.39	39	0.2458	0.0079	0.365	62,185	62,463	+278
	0.40 to 0.49	137	0.2489	0.0105	0.451	64,425	64,644	+219
	0.50 to 0.59	66	0.2490	0.0132	0.529	66,107	66,436	+329
	0.60 to 0.69	18	0.2495	0.0141	0.627	67,048	68,465	+1,417
	0.70 to 0.79	1	0.2740	0.0140	0.710	74,970	72,362	—2,608
	0.90 to 0.99	1	0.2280	0.0150	0.940	67,595	72,395	+4,800
0.275 to 0.324	0.30 to 0.39	18	0.2986	0.0085	0.366	65,920	66,753	+833
	0.40 to 0.49	70	0.2937	0.0098	0.440	67,888	68,063	+175
	0.50 to 0.59	29	0.2907	0.0128	0.540	69,725	70,202	+477
	0.60 to 0.69	8	0.2900	0.0142	0.621	72,402	71,991	—411
0.325 to 0.374	0.30 to 0.39	4	0.3443	0.0200	0.355	70,954	71,286	+332
	0.40 to 0.49	14	0.3396	0.0086	0.437	71,170	71,660	+490
	0.50 to 0.59	7	0.3354	0.0114	0.524	72,365	73,572	+1,207
	0.60 to 0.69	2	0.3675	0.0105	0.610	79,515	78,286	—1,229
0.375 to 0.424	0.30 to 0.39	2	0.3830	0.0080	0.355	73,620	73,154	—466
	0.40 to 0.49	5	0.3936	0.0102	0.448	75,107	76,555	+1,448
	0.50 to 0.59	1	0.3860	0.0110	0.500	79,750	77,280	—2,470
	0.60 to 0.69	2	0.4065	0.0220	0.645	88,545	83,832	—4,713
	0.70 to 0.79	1	0.3920	0.0080	0.750	85,260	83,732	—1,528

Table XVIII.—*Subdivision of the Groups in Table XVII that contain over Fifty Heats, and are below 0.225 per cent. in carbon, with special subdivision of the one large group showing a difference of more than 1,500 lb. between the actual and calculated strength.*

Limits of Carbon.	Limits of Manganese.	Number of Heats.	Chemical Composition.			Ultimate Strength.		
			Carbon.	Phosphorus.	Manganese.	Actual Records.	By Formula.	Difference.
Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.	Pounds per Sq. Inch.	Pounds per Sq. Inch.	Pounds per Sq. Inch.
Acid steel:								
0.125 to 0.174	0.40 to 0.44	55	0.1459	0.0569	0.417	60,560	60,484	—76
	0.45 to 0.49	41	0.1477	0.0564	0.470	61,483	61,250	—233
Basic steel:								
0.020 to 0.074	0.10 to 0.14	56	0.0327	0.0073	0.120	45,674	44,748	—926
	0.15 to 0.19	9	0.0319	0.0071	0.159	45,458	44,666	—792
0.075 to 0.124	0.40 to 0.44	33	0.0961	0.0086	0.418	49,809	51,294	+1,485
	0.45 to 0.49	20	0.0946	0.0079	0.470	49,434	51,784	+2,350
	0.40	12	0.0963	0.0075	0.400	48,949	50,965	+2,016
	0.41	4	0.0888	0.0110	0.410	49,510	50,824	+1,314
	0.42	5	0.0946	0.0080	0.420	49,469	51,096	+1,627
	0.43	4	0.1012	0.0083	0.430	50,626	51,812	+1,186
	0.44	8	0.0980	0.0091	0.440	51,053	51,776	+723
	0.45	4	0.0870	0.0078	0.450	48,521	50,869	+2,348
	0.46	5	0.0922	0.0084	0.460	49,693	51,455	+1,762
	0.47	3	0.0833	0.0073	0.470	48,383	50,718	+2,335
	0.48	4	0.1135	0.0080	0.480	50,993	53,452	+2,459
	0.49	4	0.0948	0.0075	0.490	49,253	51,982	+2,729
0.125 to 0.174	0.40 to 0.44	32	0.1522	0.0114	0.418	55,496	56,129	+634
	0.45 to 0.49	32	0.1541	0.0114	0.473	56,265	57,102	+837
0.175 to 0.224	0.40 to 0.44	66	0.2036	0.0090	0.416	60,344	60,095	—249
	0.45 to 0.49	59	0.2046	0.0107	0.468	61,208	61,247	+39
	0.50 to 0.54	48	0.2063	0.0139	0.514	62,358	62,584	+226
	0.55 to 0.59	17	0.2049	0.0124	0.566	63,086	63,199	+113

The Value of Manganese.

From Table XVII may be obtained data which will corroborate the variable value assigned to manganese. The groups containing from 0.3 to 0.39 per cent. of manganese may be plotted, using as abscissas the percentage of carbon and as ordinates the ultimate strength. The groups containing from 0.4 to 0.49 per cent. of manganese furnish another line; those from 0.5 to 0.59 another, and those from 0.6 to 0.69 another. Owing to this subdivision many of the construction points in these lines represent only a small number of heats, and they have therefore been combined by groups of three, as before explained. The result is shown in Table XIX. If the phosphorus in each group were constant, no allowance would have to be made for it; but since it varies considerably, the ultimate strength has been calculated to zero phosphorus, as shown in the last column of the table and as plotted in Figs. 11 and 12.

In Fig. 11 it will be noted that the line of 0.4 to 0.49 per cent. manganese is slightly above the base line of 0.4 manganese, which is the limit already determined, below which a decrease in manganese does not weaken steel. The number of heats containing less than 0.4 per cent. of manganese in acid steel is small and they are confined almost entirely to the two low carbon groups, so that no line has been plotted for them; but if these two groups be put upon the diagram it will be found that they are as strong as though the manganese were higher. Above the limit of 0.4 per cent. each increase in manganese raises the strength, and not only this, but the angle made with the horizontal is greater as the content of carbon increases. The lines tend to converge at the left of the figure at about 40,000 pounds, which has been

TABLE XIX.—*Classification of Groups in Table XVII According to Manganese and Combination in Units of Three.*

Kind of Steel and Composition.	Chemical Composition.			Ultimate Strength.	
	Carbon	Phosphorus.	Manganese.	Actual Records.	Deducting Effect of Phosphorus.
	Per Cent.	Per Cent.	Per Cent.	Pounds per Square Inch.	Pounds per Square Inch.
Acid steel; Mn = 0.4 to 0.49 per cent. Line AA, Fig. 11.	0.1532	0.0569	0.441	61,840	56,180
	0.1691	0.0570	0.444	63,250	57,550
	0.2335	0.0548	0.456	69,963	64,483
	0.3127	0.0476	0.461	77,465	72,705
	0.3651	0.0412	0.462	82,238	78,118
	0.4004	0.0391	0.461	85,750	81,840
	0.4339	0.0366	0.464	89,060	85,400
	0.4738	0.0349	0.466	93,528	90,038
	0.5264	0.0325	0.470	98,860	95,610
Acid steel; Mn = 0.5 to 0.59 per cent. Line BB, Fig. 11.	0.1791	0.0584	0.520	65,590	59,750
	0.1951	0.0580	0.521	66,962	61,162
	0.2614	0.0525	0.533	73,985	68,735
	0.3305	0.0482	0.541	81,259	76,439
	0.3605	0.0452	0.541	84,250	79,730
	0.3938	0.0428	0.540	87,650	83,370
	0.4361	0.0394	0.537	92,030	88,090
	0.4679	0.0383	0.537	95,640	91,810
	0.5028	0.0387	0.533	99,800	95,930
Acid steel; Mn = 0.6 to 0.69 per cent. Line CC, Fig. 11.	0.3553	0.0463	0.619	85,940	81,310
	0.3793	0.0442	0.619	88,240	83,820
	0.4374	0.0392	0.619	95,280	91,360
	0.4716	0.0366	0.615	99,280	95,620
Basic steel; Mn = 0.3 to 0.39 per cent. Line AA, Fig. 12.	0.1131	0.0097	0.360	51,505	50,535
	0.1458	0.0098	0.363	54,107	53,127
	0.1939	0.0096	0.363	58,620	57,660
	0.2427	0.0089	0.366	61,900	61,010
	0.2678	0.0089	0.365	63,860	62,970
	0.3132	0.0104	0.363	67,397	66,357
Basic steel; Mn = 0.4 to 0.49 per cent. Line BB, Fig. 12.	0.1127	0.0098	0.441	51,920	50,940
	0.1668	0.0099	0.441	57,040	56,050
	0.2129	0.0104	0.446	61,340	60,300
	0.2415	0.0101	0.445	63,775	62,765
	0.2689	0.0101	0.446	65,955	64,945
	0.3065	0.0096	0.440	68,807	67,847
Basic steel; Mn = 0.5 to. 0.59 per cent. Line CC, Fig. 12.	0.1240	0.0112	0.534	54,360	53,240
	0.1745	0.0125	0.531	59,315	58,065
	0.2163	0.0133	0.529	63,210	61,880
	0.2390	0.0133	0.530	65,315	63,985
	0.2667	0.0130	0.532	67,560	66,260
	0.3018	0.0125	0.536	70,495	69,245
Basic steel: Mn = 0.6 to 0.69 per cent. Line DD, Fig. 12.	0.1887	0.0154	0.622	61,864	60,324
	0.2192	0.0151	0.622	64,373	62,863
	0.2347	0.0146	0.621	66,020	64,560
	0.2695	0.0139	0.624	69,465	68,075
	0.3223	0.0149	0.623	76,278	74,788

found to be the base for acid steel, and they tend to spread as they go to the right, which shows that the strengthening effect of manganese increases as the content of carbon increases, and it is possible to estimate the effect by noting at what point a prolongation of these lines will cut a given ordinate, say the ordinate of 0.60 per cent. carbon. It is estimated that the line AA will cut this ordinate at 103,000 pounds, and it is known that according to the formula for acid steel the strength of steel of 0.60 per cent. carbon and

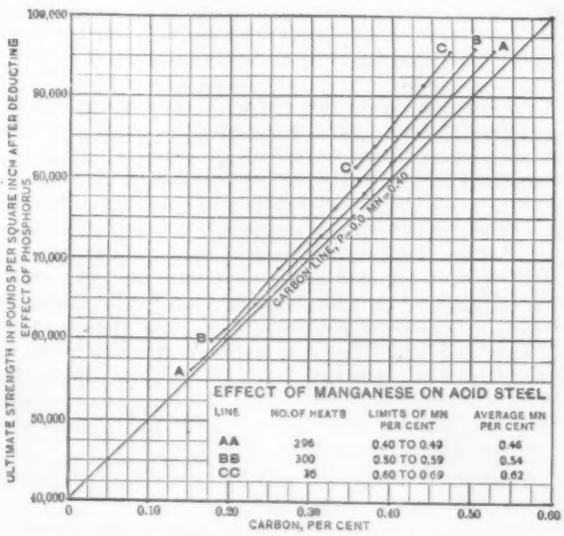

ULTIMATE STRENGTH IN POUNDS PER SQUARE INCH AFTER DEDUCTING EFFECT OF PHOSPHORUS
CARBON, PER CENT
CARBON LINE, P=0.0, MN=0.40
EFFECT OF MANGANESE ON ACID STEEL
LINE NO. OF HEATS LIMITS OF MN PER CENT AVERAGE MN PER CENT
AA 296 0.40 TO 0.49 0.46
BB 300 0.50 TO 0.59 0.54
CC 36 0.60 TO 0.69 0.62

Fig. 11.—Effect of Manganese on Acid Steel.

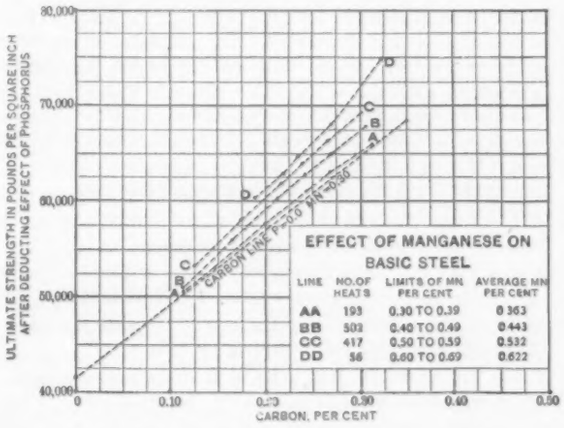

ULTIMATE STRENGTH IN POUNDS PER SQUARE INCH AFTER DEDUCTING EFFECT OF PHOSPHORUS
CARBON, PER CENT
CARBON LINE, P=0.0, MN=0.30
EFFECT OF MANGANESE ON BASIC STEEL
LINE NO. OF HEATS LIMITS OF MN PER CENT AVERAGE MN PER CENT
AA 193 0.30 TO 0.39 0.363
BB 503 0.40 TO 0.49 0.443
CC 417 0.50 TO 0.59 0.532
DD 56 0.60 TO 0.69 0.622

Fig. 12.—Effect of Manganese on Basic Steel.

0.40 per cent. manganese would be 100,000 pounds. There is, therefore, an increase in strength of 3000 pounds, due to the amount of manganese in excess of 0.40 per cent. In Table XIX it will be seen that the average manganese of the line AA is about 0.46 per cent., so that the strengthening effect of manganese in a steel of 0.60 per cent. carbon, as shown by this one line, is 500 pounds for each 0.01 per cent. In a similar way the line BB gives a value of 429 pounds, and the line CC 454 pounds.

The variation in values does not represent any law, but arises from determinative errors, and the results should therefore be averaged. The line AA represents 296 heats; BB, 300 heats, and CC, 36 heats, so that the true average is 464 pounds for the influence of 0.01 per cent. of manganese upon a steel of 0.60 per cent. carbon. In Table VII the corresponding figure was 480 pounds.

The results from the basic steel are plotted in Fig. 12, the base being 0.30 per cent. manganese instead of 0.40 per cent., as in acid metal. It will be evident that the same law holds good that the effect of manganese increases with higher carbons. An analysis according to the same method used in the acid steels gave a value for 0.01 per cent. of manganese of 200 pounds for a steel of 0.35 per cent. carbon, when Table XIII calls for 234 pounds. In both the acid and the basic steels the agreement is all that could be expected, so that it would seem that in the steels under consideration the manganese has a value varying with the amount of carbon present.

Conclusions.

Carbon.—In acid steel each 0.01 per cent. of carbon strengthens steel by 1000 pounds per square inch when the carbon is determined by combustion. The strengthening effect is 1140 pounds for each 0.01 per cent. as

determined by color, owing to the fact that the color test does not determine all the carbon present.

In basic steel each 0.01 per cent. of carbon strengthens steel by 770 pounds per square inch when the carbon is determined by combustion. The strengthening effect is 820 pounds for each 0.01 per cent. as determined by color.

Phosphorus.—Each 0.01 per cent. of phosphorus strengthens steel by 1000 pounds per square inch.

Manganese.—Each 0.01 per cent. of manganese has a strengthening effect upon steel, and the effect is greater as the content of carbon increases. Below a certain content of manganese the effect is complicated by some disturbing condition, probably iron oxide, so that a decrease in manganese in very low carbon steels is accompanied by an increase in strength. In acid steel each increase of 0.01 per cent. in manganese above 0.4 per cent. raises the strength of acid steel an amount varying from 80 pounds in a metal containing 0.1 per cent. carbon to 400 pounds in a metal containing 0.4 per cent. carbon. In basic steel each increase above 0.3 per cent. raises the strength an amount varying from 130 pounds in a metal containing 0.1 per cent. of carbon to 250 pounds in a metal containing 0.4 per cent. of carbon.

Sulphur.—The effect of sulphur on the strength of acid and of basic steel is very small.

Formulæ.—From the foregoing results the following formulæ may be written, in which C = 0.01 per cent. of carbon, P = 0.01 per cent. of phosphorus, Mn = 0.01 per cent. of manganese, R = a variable to allow for heat treatment, and the answer is the ultimate strength in pounds per square inch. The coefficient of manganese in acid steel, called x, is the value given in Table VII, and applies only to contents above 0.4 per cent. The value of manganese in basic steel, called y, is the value given in Table XIII, and applies to contents above 0.3 per cent.

Formula for acid steel, carbon by combustion:

$$40{,}000 + 1000\ C + 1000\ P + x\ Mn + R = \text{ultimate strength.}$$

Formula for acid steel, carbon by color:

$$39{,}800 + 1140\ C + 1000\ P + x\ Mn + R = \text{ultimate strength.}$$

Formula for basic steel, carbon by combustion:

$$41{,}500 + 770\ C + 1000\ P + y\ Mn + R = \text{ultimate strength.}$$

Formula for basic steel, carbon by color:

$$42{,}000 + 820\ C + 1000\ P + y\ Mn + R = \text{ultimate strength.}$$

I am indebted to my brother, J. W. Campbell of the Pennsylvania Steel Company, for collecting the data and assisting in the arithmetical work involved in this paper.

The National Electric Company.

The National Electric Company, Milwaukee, Wis., has entered into an important arrangement with Robert Lundell and Robert T. Lozier by which the National Company will manufacture and market the new motors, generators and systems of operation and control that are covered by the latest inventions of Robert Lundell, under the commercial direction of Robert Lozier. Mr. Lozier will also act as general manager of the Electrical Sales Department of the National Company. Under this arrangement Mr. Lundell assumes the direct supervision of the engineering involved under the license that he grants the National Company. It might be said that this license covers all of Mr. Lundell's inventions not already under license to other companies and all inventions that he may hereafter make during the life of this license. Some of these patents are for a new type of motor and dynamo frame construction, as well as a new method of commutation by which a material gain is obtained in the space occupied by the apparatus, its efficiency and the flexibility of its speed control and regulation.

This form of construction represents an important departure in standard motors of fixed speed and is particularly advantageous in variable speed motors for direct application to machinery, both from point of construction and flexibility of control. The Lundell inventions are equally valuable in systems of regenerative operation and series parallel control and the numerous other uses to which electric motors are now so generally applied.

The Johnson-Lundell Traction Company of England has been organized to manufacture under these patents in Great Britain and elsewhere abroad.

Dr Nelson P. Hulst Retires.

Nelson P. Hulst, Ph.D., vice-president of the Oliver Iron Mining Company, has resigned to take effect January 1. Dr. Hulst is a very familiar figure in Lake Superior mining and geology, and is a man of high reputation and standing wherever known. He is a geologist of great note, and has been exceedingly active in the development of the Lake Superior region for many years. He was, perhaps, the first to recognize the Menominee range and to appreciate its importance, and was connected closely and directly with its development until in 1897 he was made the general manager of the Oliver Iron Mining Company. This was at the time that Messrs. Oliver and Carnegie formed the idea of taking mines for their steel interests and formed the company of that name.

Dr. Hulst continued as general manager until the formation of the United States Steel Corporation in 1901,

DR. NELSON P. HULST.

when co-ordination of the many and diverse mining interests coming under the control of that corporation demanded complete modification in methods of the constituent mining companies. The immense amount of detail labor required of the executive head of the company, as then constituted, called for much travel and made it necessary that the work should be split up and that younger men carry the new and heavier burden. Dr. Hulst was made vice-president and put in charge of his favorite work, for which he was so admirably qualified, that of geology and exploration.

Dr. Hulst was the discoverer of the Pewabic mine, at Iron Mountain, and retained active official connection with it permanently. He was many years head of the Menominee Mining Company, which opened much of the range of that name, and was manager of the Interstate Mining Company and other corporations whose history is linked with that of the Lake Superior region. He has important private interests, to which he can now devote the attention they deserve. He will maintain his home in Milwaukee, from which he never moved to Duluth, as did most of the Steel Corporation officers, and he will probably continue his winter home in the former and his summer home in the latter place. His resignation is much regretted by all his associates.

The American Shipbuilding Company, Cleveland, Ohio, has closed contracts for three more ore carriers of the largest size. Two of the vessels were ordered by G. A.

Tomlinson of Duluth, which makes five steamers of the largest class which Mr. Tomlinson has ordered for 1905 delivery. Each of these vessels will be 524 feet over all, 504 feet keel, 54 feet beam and 30 feet deep, and each will have a cargo capacity of about 9000 tons. The boats will be built at Bay City, Mich. The other contract was placed by Miss Anna C. Minch, Henry Steinbrenner and others of Cleveland. She will be 500 feet over all, 480 feet keel, 52 feet beam and 30 feet deep, and will have a capacity of 8600 tons of ore. It has not been decided where she will be built.

The Republic Iron & Steel Company.

The annual meeting of the stockholders of the Republic Iron & Steel Company was held in Jersey City, N. J., October 19. President Alexis W. Thompson submitted his annual report, as follows:

The past year witnessed a depression in the iron and steel industry of unusual severity. In the early part of November, 1903, the price of steel declined $6 per ton, demand for iron and steel products diminished, and production was reduced nearly 40 per cent. At the end of the first half of the year general conditions were such that it was deemed prudent to adjust our inventory values, and $669,616.41 was written off, thereby reducing stocks of raw and finished materials to figures considerably less than those by which they could be replaced. On the other hand, the cost of production increased, as the diminished demand prevented some of our works from operating full time, and entirely suspended operations at others, and an extremely severe and long winter further increased the cost of production by increasing cost of fuel and the amount of labor required. At the beginning of March, however, the volume of business began to increase, and our operations have since been profitable. Today the outlook is again very encouraging.

The amount expended during the year for new construction was smaller than in any year since the organization of the company. This work consisted chiefly in the installation of new converters and a new 40-inch mill at our steel plant in Youngstown and increasing the capacity of our furnaces, coking and mining plants at Birmingham. This new work was absolutely necessary to reduce the cost of production to the lowest possible point. All new construction work which was contracted for is now completed.

By rigid economy and a quite general reduction of salaries the fixed charges have been reduced as far as possible without bringing about the disorganization of an efficient working force.

An interesting and perhaps important factor in the future of the company may be found in its oil operations. At the time of the organization of the company and later it acquired gas and oil leases on 18,000 acres of land for the purpose of supplying the Muncie mills with natural gas. As the gas pressure diminished production of oil increased. The total oil production in 1903 was 35,107 barrels. In the first six months of 1904 it was 27,913 barrels; in the month of September, 1904, it was 41,885 barrels. Present production averages about 1400 barrels per day. While it is too early to form a proper estimate of the value of our oil property, we feel justified in carrying on vigorous development work. We now have 71 producing wells and are engaged in drilling 17 more.

The company has recently completed its financial arrangements, which have been under negotiation for some time, through the First National Bank and the First Trust & Savings Bank, both of Chicago. The company will issue $10,000,000 first mortgage bonds, protected by a sinking fund, which will form the collateral security for a loan of $7,000,000 on its two and three year notes. The bonds will be deposited for the benefit of those who purchase these notes with the First Trust & Savings Bank, which institution is also trustee under the mortgage.

A sufficient amount of these two and three year notes has already been sold to take care of the company's floating indebtedness and to provide for all its present requirements. The balance will be placed when and as the company requires money. There will be no public subscription. It has not yet been determined whether the bonds will ultimately be sold or the notes liquidated from the earnings of the company, which, with the revival of the steel business, promises to be large.

A short time ago a committee of leading experts examined into the ore and coal properties of the Republic Iron & Steel Company in the Birmingham district. Coming from such an authoritative source, and being based upon a careful examination of the properties, we deem their report to be of sufficient importance for submission to our stockholders. It shows conclusively that our holdings of ore and coal in that district are abundant to supply our Southern furnaces for more than 50 years.

With a tonnage of orders on our books at this date engaging the capacity of our plants now in operation for the balance of the year, and operating at much lower costs than ever before, due to the new construction work now completed, we look for favorable results in the immediate future.

The profit and loss account for the year ending June 30, 1904, is as follows:

Profit from the business of the company, after deducting all expenses excepting improvements, renewals and repairs		$1,306,068.05
Less depreciation:		
Including amounts expended during the year for reconstruction, renewals and repairs	$890,640.07	
Amount written off for depreciation of inventories	669,616.41	
		1,560,256.48
Net loss during year		$254,188.43
Surplus June 30, 1903	$3,248,206.28	
Net loss during year	254,188.43	
		$2,994,017.85
Deduct quarterly dividend on preferred stock, paid October 1, 1903		357,295.75
Surplus on books June 30, 1904		$2,636,722.10

The balance sheet as of June 30, 1904, is as follows:

Assets.

Real estate, plants, buildings, machinery and other permanent investments		$40,706,398.82
New construction:		
May 1, 1899, to June 30, 1900	$1,218,203.44	
July 1, 1900, to June 30, 1901	1,164,175.26	
July 1, 1901, to June 30, 1902	2,003,183.95	
July 1, 1902, to June 30, 1903	1,681,040.32	
July 1, 1903, to June 30, 1904	457,985.87	
		6,524,588.84
Stocks in sundry companies at cost		538,538.07
Producing oil and gas wells, pipe lines and leases		126,928.87
Prepaid royalties on ore and coal and prepaid insurance		466,835.55
Inventories of raw and finished materials		4,407,651.67
Accounts and bills receivable		2,507,560.59
Cash		1,038,532.47
Total		$56,317,034.88

Liabilities.

Capital stock issued:		
Preferred	$20,852,000.00	
Less in treasury	435,100.00	
		$20,416,900.00
Common	$27,352,000.00	
Less in treasury	161,000.00	
		27,191,000.00
Accounts and bills payable		5,564,097.97
Reserve for depreciation of ore and coal mines		251,805.55
Reserve for taxes and insurance		187,608.05
Reserve for possible loss in collection of outstanding accounts and bills receivable		68,901.21
Profit and loss account:		
Net loss during year	$254,188.43	
Add quarterly dividend on preferred stock paid October 1, 1903	357,295.75	
Amount to be deducted from surplus	$611,484.18	
Surplus June 30, 1903	3,248,206.28	
Surplus June 30, 1904		2,636,722.10
Total		$56,317,034.88

The gross sales and profits from May 1, 1899, to June 30, 1904, were as follows:

Period.	Gross sales.	Gross profits.	Depreciation.	Net profits.	Dividends.	Amount carried to surplus.
May 1, 1899, to June 30, 1900	$35,900,244.73	$5,684,100.87	$2,040,371.95	$3,643,728.92	$1,421,679.00	$2,222,049.92
July 1, 1900, to June 30, 1901	15,984,829.89	1,034,248.31	725,149.55	309,098.76	1,421,483.00	*1,112,384.24
July 1. 1901, to June 30, 1902	24,430,679.95	3,260,076.49	1,011,245.02	2,248,831.47	1,424,108.00	824,723.47
July 1, 1902, to June 30, 1903	25,647,170.27	4,123,500.16	1,382,600.03	2,740,900.13	1,427,083.00	1,313,817.13
July 1, 1903, to June 30, 1904	17,242,569.38	1,306,068.05	1,560,256.48	*254,188.43	357,295.75	*611,484.18
Totals	$119,205,494.22	$15,407,993.88	$6,719,623.03	$8,688,370.85	$6,051,648.75	$2,636,722.10

* Loss or deduction.

Charles F. Guthrie was elected a director to succeed E. N. Ohl, and directors Leonard C. Hanna, George A. Baird, P. L. Kimberly and A. W. Houston were re-elected. After adjournment the following official statement was promulgated:

On September 30 the available quick assets of the company exceeded $7,500,000. The proceeds of the two and three year 5 per cent. notes already subscribed provide funds sufficient to take up the floating indebtedness of the company, which, on September 30, was $4,305,909.36, also ample additional working capital to take care of present requirements. The balance, up to $7,000,000 will be sold as needed at the Bessemer steel plant for a

sheet and tin bar mill and for a rail mill. These extensions as well as the increase of our coke capacity in the Connellsville district to provide our own necessities have all been authorized by the Board of Directors. The additional finishing capacity at the steel plant will provide for a full operation of our Northern blast furnaces as well as an economical operation of ore and coal mines under the average conditions of business, which has heretofore not been the case. The physical condition of all our properties which we operate is first class. The oil production in the Indiana field has already become an important factor and shows promise, with further development, of a substantial increase. We have felt the general improvement in the iron and steel industry, and have now sufficient business booked to insure full operation for the balance of this year and with good prospects for the coming year.

Features of Canadian Trade.

Steel Rail Entry.

TORONTO, October 22, 1904.—It will be recollected that the order in Council of August 27 establishing a $7 duty on steel rails fixed certain dates as limits for the continued free entry of rails. If a given shipment is shown to have been purchased before August 28, if it is passed through the customs before November 30, and if it is laid to form a track before February 28, it is non-dutiable. It is treated as part of the trade that was transacted while rails were on the free list. Should, however, any of these dates be passed before the condition it limits is carried out, the duty applies. Of course, if the rails are purchased after August 28 it matters not when they are entered or when they are laid; they are subject to the duty. If they were purchased before August 28 and imported after November 30 they may be laid long before February 28, but they will still be assessable for duty. And no matter when they were bought, or when they were entered, the duty is collectable if they are not laid before the last day of November.

Instructions have recently been issued to customs collectors as to the procedure in respect to rails for which exemption from duty will be claimed. If the rails have been bought before August 28 and imported on or before November 30, and if the collector is satisfied that they will be laid within the exemption limit of time, he may permit the importer to ex-warehouse them without duty, but subject to the following conditions, which are to be written on the face of each entry—namely: "The rails are to be laid in the tracks of this company's railway at [specifying the location] on or before February 28, 1905, and proof thereof furnished to the collector at this port within 60 days thereafter, otherwise duties and penalties under the customs laws shall apply thereto."

Before delivering any such rails without duty collectors are to require importers to produce their contracts showing the purchase of the rails abroad prior to August 28, 1904. Collectors are also to keep a special record of rails warehoused under the foregoing instructions, and report to the Customs Department if the proof as to the rails being laid is not duly filed in each case as required.

Rails are now coming forward rapidly from mills in the United States. Large estimates have been made of the quantities that will be delivered before November 30. As much as 100,000 tons has been reckoned on by men who are supposed to have data for something more than a conjecture. The Canadian Pacific Railway Company's imports are the largest. It is said that the Pennsylvania Steel Company's contract with the Canadian Pacific Railroad may be more than the Pennsylvania Company can fill from its own mills within the time expiring at the end of November, and that other rail making companies are working on subdivisions of the contract to insure full delivery on time.

A Dumping Duty Grievance.

Strong representations have been made to the Minister of Customs concerning an effect of the operation of the antidumping duty. Let us take a concrete case for the purpose of illustration. A Canadian wholesale hardware dealer buys a lot of carpenters' tools from an American manufacturing concern. The price paid is the one at which the manufacturers lay down the goods at certain distributing centers in the United States, say, New York, Baltimore, Boston, in the East, and Chicago, St. Paul and St. Louis in the West, and in all territory between these centers and the works. This freight allowance is a matter of regular trade custom in the domestic trade of the United States. It is in no sense a special concession on an export business. Hence, it ought not to be confiscated in the form of special or antidumping duty. But it is being so confiscated. If a Canadian wholesaler in Winnipeg buys a carload of builders' hardware in Pittsburgh he is getting it at a price that covers transportation to, say, St. Paul. As a matter of fact, it averred transportation to Winnipeg, which had come to be regarded as a distributing center. Should he deduct an amount that is equivalent to the freight charge to that point and put in the remainder as the net price paid, he will be shown by the customs collector that such net price is below the price current at Pittsburgh, the official not making allowance for the carrying charge included in the current price he quotes. Winnipeg houses have now to lose the freight, as the Government seizes it. That is, a Winnipeg merchant who was before on the same freight footing as his competitor in St. Paul, is now at a disadvantage as against the latter. Both the Winnipeg merchant and the St. Paul merchant buy in Pittsburgh, Philadelphia or Chicago. Before the antidumping duty came into force both merchants got their goods at the same delivered price. Now the Winnipeg man has to give up a portion of this equality, because he has to pay regular duty or the net price at the point of origin, and has to pay in addition a special duty equivalent to the transportation charge included in the gross quotation. In consequence of this St. Paul merchants are at an advantage in competing for the trade of the Canadian West, for St. Paul merchants pay only the delivered price at St. Paul. The difference in favor of the American hardwareman is said to be in some articles as much as 10 per cent. The situation is similar at other points. On this question the Commissioner of Customs answered a protest made by Montreal wholesalers recently, as follows:

Respecting the freight deduction I may state that in 1890 the Department of Customs issued the following regulation:

"Freight allowances deducted on invoices from the usual home selling prices of goods for consumption at the place of export is a special reduction which should not be allowed in appraising the value of goods for duty purposes."

Under the law the value for duty of any article cannot be less than its fair market value when sold for home consumption in the market of the country whence, and at the time exported directly to Canada, therefore the freight deduction which appears on invoices covering importations of these baths cannot be allowed for customs purposes in Canada.

I may also state for your information that during the recent session of Parliament legislation was passed which stipulated that where the selling price or export price to a Canadian purchaser of goods of a class or kind made in Canada is less than the fair market value for duty, there shall be collected in addition to the duty properly payable on the goods when properly valued a special duty equal to the difference between such selling price and such fair market value, provided that the special duty shall not in any case exceed 50 per cent. of the proper duty payable, also provided that when the difference between the fair market value of the goods and the selling price thereof to the importer as aforesaid amounts only to a small percentage of their fair market value, such small percentage shall be exempt from the special duty clause.

The Board of Customs has decided that where the difference between the selling price of the goods to the importer in Canada does not exceed 5 per cent. of their fair market value such difference shall not be subject to the special duty clause, unless otherwise decided in specified cases, the whole difference, however, when exceeding 5 per cent., to be taken into account in cases where the special duty is applicable. If the difference in this case between the selling price and the value for duty as above determined exceeds 5 per cent. the goods will be subject to the application of the special duty clause.

Observations upon the change in state of aluminum alloy made by Prof. Ernest Wilson are mentioned in the London *Engineer*. During three years' exposure to London atmosphere copper-aluminum alloys have gradually diminished in total conductivity, the extent being greater the higher the percentage of copper. Nickel-copper aluminum alloys, which show such a remarkably greater tensile strength than good commercial aluminum, during the last year, also diminished considerably in conductivity. On the other hand, manganese-copper aluminum alloys have undergone comparatively little reduction in total conductivity, and one of them has a comparatively high tensile strength.

Notes from Great Britain.

The Iron Trade in General.

LONDON, October 15, 1904.—The chief event of the week has been the Birmingham quarterly meeting, which was well attended, South Wales, London, Liverpool and Manchester being unusually well represented. The prevailing note was one of greater hopefulness. There are two flies in the amber, however. The first is that prices are not remunerative; the second is foreign competition. The triff reformers make moan and call it "dumping." A year or two ago "dumping" was regarded as an almost discreditable form of business, but if every time goods come into the market it is called "dumping," it will become quite a respectable market phrase and its original meaning will be lost.

The iron industry has suffered both locally and nationally, if the Board of Trade returns are to be taken as a fair indication of the general state of trade. They are not, of course, a perfect reflex, for it is usually the case that when the home trade is slack exports make the best show, and when, on the other hand, it is flourishing, less attention is devoted to foreign business. During the nine months of the present year, as compared with the same period of 1903, the greatest decline in the whole range of exported goods has occurred in iron and steel. There has been a decline in value of £2,295,031. An examination of the figures which go to make up the total is exceptionally interesting. From these it is obvious that the decline has been more manifest in prices than in quantities. The shipments of all classes of iron and steel show a falling off amounting to 312,982 tons. In searching for any abnormal condition prevailing in 1903, one is at once struck with the figures relating to pig iron. The value of the exports of this commodity in the first nine months of this year was £1,781,723, while in 1903 it was £2,712,627, which shows a decrease this year of £930,904. In that way a considerable portion of the value decrease of the whole of iron and steel is accounted for. The explanation of the decline in pig iron is not far to seek. It will be remembered that during some portion of 1903 pig iron was being largely exported to the United States in order to make good the deficiency of the domestic supply. The result was, of course, an increase in British production and prices. This year that external support has been withdrawn, and during the whole of the year pig iron exports have shown heavy declines. The lesson of the export figures would, therefore, seem to be less gloomy than at first sight appears.

One of the reasons most commonly advanced in explanation of the depression in trade as a whole has been "dumping" by America and Germany. The import returns show how largely the importation—or "dumping," according to the term individually preferred—has been concentrated on one particular material. The whole volume of our iron and steel imports for the nine months of this year declined £44,728 as compared with 1903, and yet under the heading of "ingots, blooms, billets, slabs, sheet bars, tin plate bars," the imports for the same period increased 264,923 tons and £1,057,643. Against this, British exports of similar material amounted to the insignificant total of 3302 tons, valued at £26,764, which represents a decline of 8933 tons and £44,547.

Canada and British Steel.

At a meeting of the Glasgow Chamber of Commerce this week William Jacks, the chairman, submitted a communication from the Liverpool Chamber of Commerce as to the customs regulations (invoices and declarations) for goods shipped to Canada. The communication, he said, stated that it was thought that compliance with the regulations in question, even if it were not absolutely impossible in many cases, would place serious obstacles in the way of trade between Great Britain and Canada. He went on to explain that they had in Scotland a combine of steel plate makers. There was also one in England, and these fixed the prices for Scotland and England, respectively. But the Scottish makers were not bound by the Scottish prices in England, and they sold plates in the North of England; nor were the English manufacturers bound by their English prices for Scotland, and they sold their plates in Scotland. The same applied to Belfast, and there was keen competition. But this applied to other countries as well, and Canada came in and said: "It shall not apply to us. You may sell to Canada as cheap as you like, but if you in Scotland charge Belfast prices or English prices then we will put on a duty representing the difference between the prices charged to your Scottish shipbuilders and the prices at which you sell to England and Ireland. We will not have this stuff dumped upon us at lower prices than your home prices."

The Otis Steel Company.

The eighth ordinary general meeting of this company was held last week in London. In moving the adoption of the report, the chairman, after remarking that, in the board's opinion, the results of the year's working were satisfactory, taking into consideration the depressed state of trade which had existed in America, said that the gross profit on trading amounted to £20,838, which, added to the other sources of revenue, gave a total profit of £22,994. Deducting from that the London management expenses, directors', trustees' and auditors' fees, and interest upon prior lien debenture stock, there remained a balance of £16,659. This would be dealt with by writing off £12,500 for depreciation, in accordance with the agreement between the company and the A and B debenture stockholders; and applying the balance of £4159 toward paying interest upon the A debenture stock. That was sufficient for a distribution of 2 per cent., requiring £3821, and it would enable them to carry forward a balance of £338 to the A debenture stockholders' interest suspense account. The interest upon the A debenture stock being cumulative, the remaining 3 per cent. would be paid as soon as profits permitted.

The sums set aside for debenture stocks redemption account out of the profits of the last two years and the proceeds of the sale of a piece of the company's land in Cleveland amounted to £12,986. Debentures for £20,462 were redeemed out of that sum, so that a nominal profit of £7475 was made by the company on the transaction. That, together with £6386 applied to the same purpose out of last year's profit, and £428 carried forward last year, made a total of £14,293, which had been applied in writing down the property account. The amounts outstanding as assets under the heading of "Land for plant, machinery, use of tools, and goodwill," had been written down during the year from £636,970 to £601,068.

The profits of the year would have been augmented by several thousand pounds had it not been for the depreciation of stocks by falling markets. Those stocks were necessary to carry on the business, and although they were reduced to a minimum quantity in falling times, yet the lowering of their value during the year had caused a considerable loss, which had been written off before arriving at the trading profit for the year. The works were in a better condition now than ever before in the history of the company, and their continued improvement had the constant attention of the board and the managing directors. Had it not been for the liberal expenditure on new plant made in the past, they would doubtless have been obliged to present results less satisfactory than those now shown.

S. G. H.

The Worcester works of the American Steel & Wire Company are rapidly getting on a full force basis. Night gangs have been put on in a number of departments, and the indications are that every department will be running day and night within a short time. Orders are coming in very rapidly, and indicate an unusually good fall and winter's business in the high grade specialties manufactured at the Washburn & Moen works.

The Board of United States General Appraisers, in a decision handed down October 11, overruled a protest by Austin Baldwin & Co. of New York against the classification of chilled iron sand as a manufacture of iron at 45 per cent. The merchandise was variously invoiced as "chilled iron," "diamond grit" and "steel grit." The importers claimed that it was dutiable at 6-10 cent a pound under the provision for steel not specially provided for.

The Boiler Inspection Laws.

WASHINGTON, D. C., October 25, 1904.—The Board of Supervising Inspectors of Steam Vessels convened here to-day by virtue of an executive order resulting from the "Slocum" disaster, and will probably remain in session until the convening of Congress on December 5. While the immediate purpose is to act upon the recommendations of the commission appointed to investigate the "Slocum" affair, the board will consider all other pending matters relating to the steamboat inspection service and in this connection will take up the text of the bill, passed by the Senate at the last session, providing for the amendment of the inspection laws with special reference to the construction of boilers. As this important phase of the subject is thus to be reopened and the whole matter of boiler construction and inspection considered *de novo*, an opportunity will probably be afforded the American Boiler Manufacturers' Association again to lay before the board and the committees of Congress such representations as may be deemed advisable with regard to the propriety of appointing an expert joint commission to revise the boiler laws, not only with a view to bringing them up to the standard of the latest practice in this country, but also to harmonizing them with the regulations of the leading maritime countries of the world.

Joint Commission Plan.

It is now more than 18 months since the subject of amending the laws and regulations regarding boiler construction was vigorously taken up by the American Boiler Manufacturers' Association and a delegation appeared before the Board of Supervising Inspectors, then in session in this city, and urged its co-operation to secure legislation authorizing the appointment of a joint commission. The inspectors were not favorably impressed with this idea, doubtless because it would involve the application by the board of some of its functions, and in the report finally made to the Secretary of Commerce and Labor the commission plan was not discussed. Subsequently, E. D. Meier and William H. Fletcher appeared before the House Committee on the Merchant Marine and Fisheries to urge the passage of a bill previously introduced creating a commission to be composed of experts representing the merchant marine, the navy, manufacturers of steel plates, boiler and engine builders, &c.

Notwithstanding the very strong representations made by these acknowledged experts, the Department of Commerce and Labor and the House Committee ignored all the recommendations of the trade and within a fortnight of the end of the session presented a bill, recognized by the Department even as but a half measure, which was hurried through the Senate but finally permitted to die on the House calendar after having been reported from the Committee on the Merchant Marine and Fisheries.

Features of Pending Bill.

This bill contained two provisions, however, that were indorsed by the trade and that if enacted will to some extent remedy the shortcomings of the existing statutes. At present the boiler regulations can be revised only by concurrent action of the Secretary of Commerce and Labor and the Board of Supervising Inspectors. This board assembles only once a year, and as its members come from all parts of the United States they cannot easily assemble oftener. The result is that the regulations are now almost as inelastic as the statute law. Section 1 of the pending bill gives the Secretary control over these regulations while retaining the duty of the board to meet and make recommendations. Inasmuch as these regulations deal largely with mechanical appliances, a considerable degree of elasticity is needed in them to adjust them to the improvements that are constantly being made.

Another important change is provided by Section 5 of the bill. The existing laws describe all the details of boiler construction and the various mechanical appliances used on board ship. The section referred to repeals those parts of the law embracing these requirements and substitutes a provision which goes on the theory that the statute law should provide only the general requirements as to what "may be safely employed in the service proposed without peril of life," leaving the details as to measurement, sizes, form and condition to be adjusted by regulation from time to time as the state of the art may require.

Whether, in view of the recent developments, the American Boiler Manufacturers' Association will be disposed to modify the pending bill remains to be seen, but it is obvious that an opportunity is here presented for reviving the plan for an expert commission, and thus securing a series of laws and regulations with regard to the construction of boilers on a par with the best modern practice. W. L. C.

Projected Philippine Tariff Changes.

WASHINGTON, D. C., October 25, 1904.—The Secretary of War has received from Collector Schuster, at Manila, the full text of the projected revision of the Philippine tariff. The schedules are now undergoing careful examination at the hands of Col. Clarence R. Edwards, chief of the Bureau of Insular Affairs, who will make such changes as the experience of the bureau has indicated to be desirable. The next step will be to make public the full text, for the purpose of enabling American manufacturers and exporters to make suggestions or criticisms before the schedules are finally approved by the Secretary of War. This plan was followed with reference to the revision made three years ago and was found to work extremely well. All interested persons had an opportunity to examine the new rates of duty before they were finally adopted, and the Department accepted quite a number of suggested changes. During the past three years the tariff thus framed has operated very satisfactorily, but of late the rates have been found to be too high from the standpoint of consumers in the islands.

As soon as the new schedules have been approved by the Secretary of War the Philippine Commission will be advised by cable of the fact and the new tariff will be formally enacted by the commission, after which the Secretary of War will send it to Congress for its approval, which must be given before the new rates can become effective.

Unlike the tariff adopted for Porto Rico after the cession of that island to the United States, the Philippine tariff provides no discriminating rates in favor of American manufacturers and exporters. As a result our producers are experiencing much difficulty in holding their own in the Philippine markets, and in certain important lines are actually losing ground. It is a curious circumstance, for example, that while the Philippine Commission is planning to extend the railway system of the islands upon guarantees to be given by the United States, the managers of existing roads are buying nearly all their rails and other material in Germany, England and Belgium. Of more than $250,000 worth of rails purchased during the last fiscal year only $3766 worth were bought in the United States.

Under the new tariff important reductions will probably be made in several items of the metal schedule, and Congress will also be asked to grant authority for the free entry of all material for the construction of railroads. Whether under the new conditions American manufacturers can increase their share of the Philippine trade without the assistance of differential rates remains to be seen. W. L. C.

The recent filing of a supplementary mortgage for $1,000,000 by the American Brake Shoe & Foundry Company, New York, has given the impression that the company was increasing its bonded indebtedness, when such is not the case. About two years ago the company mortgaged its property for $1,000,000, and since then has acquired additional plants at Bloomfield, N. J., and Chattanooga, Tenn. To cover these two plants also the new mortgage, which is merely the old one extended to take in the entire property of the company, was given, the amount of the mortgage remaining the same.

Pacific Coast Business Conditions.

SAN FRANCISCO, CAL., October 20, 1904.—The season has set in auspiciously, as we have had very heavy rains, which, though in one sense untimely and doing considerable harm to certain products, have encouraged farmers generally to begin plowing and give bright hopes of good crops next year. We have not had such heavy rains at this period of the year since California's admission to the Union. These rains have interfered somewhat with trade, rendering transportation difficult outside of the railroads.

In the hardware and metal trades business has been quite large, more so in those departments that cater to the wants of the lumbermen and oil producers, the mines and the building trades. The demand for redwood lumber has been very large, necessitating large additions and improvements at the mills and additional machinery in the shape of donkey and traction engines, &c., in the forests. Several new mills are to go up, the cost of which will not be less in the aggregate than $400,000 to $500,000. This will give some work to the manufacturers of saws and saw mill machinery. Many small railroads are being built into the forests, which call altogether for a great deal of railroad material. Constant additions are being made to the fleet of steam and sailing vessels engaged in lumber transportation. Here also is considerable demand for machinery, engines, boilers, &c.

It is, however, in the building trade that business in this line keeps up especially, inasmuch as the number and value of contracts in every part of the State, especially in San Francisco and Los Angeles, seem to increase as the year goes on. In one week recently the contracts in the city amounted to $750,000, while this week there are over $400,000, and the month of September exceeded in value of building contracts that of last year for the same time by over 60 per cent. This means an increase in iron and steel for building purposes and in building hardware of the same amount, and October will give as equally good a record as September.

The whole trade of the coast is up in arms against the proposed parcels post. A committee has been appointed from the mercantile community at large, in which all the leading hardware houses are represented, to combat the legislation now proposed. The merchants say that there is no popular demand for it and that it serves no general useful purpose. It strikes at all the coast trade, both wholesale and retail, inasmuch as small parcels of goods of all descriptions can in this way be forwarded to the consumer direct, thus doing away with the trade of both jobber and retailer to that extent. It would give the merchants of other sections the opportunity for which they have been looking for many years—to cut into our trade. It reminds one of the time some years ago when a large Philadelphia merchant sent out men to this city who took orders for single suits of clothes. There is such a thing as turning the Government of the country into an adjunct of large mercantile houses. The post office was never intended for such a purpose as this. Clearly the parcels post is not in favor at this end of the line.

The imports of iron and metals as a whole have been smaller for the third quarter of the year than in 1903. In July, August and September of that year 7634 tons of pig iron were imported by sea. For the same time this year 3608 tons were imported, or just about half the amount.

J. O. L.

An Interesting Contest Among Draftsmen.

The Electric Controller & Supply Company, Cleveland, Ohio, posted a notice in its drafting room recently to the effect that it was its intention to relieve Mr. Pirtle, who has been in charge of its exhibit at the Louisiana Purchase Exposition since the opening of the fair. As a means of selecting the man best suited for this work it was decided to inaugurate a contest among the draftsmen, allowing all to enter. The contest consisted of two written articles, one on the company's improved direct motor drive for planers and the other on its mill table controller. All articles presented were to be judged from the following standpoints:

1. The clearest description of the functions and operation of the various switches, circuits, &c., from an engineering standpoint, to count 40 points.
2. The best statement of the advantages arising from the use of the apparatus, viewed from the standpoint of the customer, to count 30 points.
3. The best composition, from the standpoint of rhetoric and grammar, to count 30 points.

All work on the articles to be done outside of office hours.

The four judges consisted of A. C. Eastwood, engineer; R. I. Wright, assistant engineer; Harold McGeorge, general manager, and J. H. Hall, chief draftsman. Competition was keen, and a number of interesting papers were presented, requiring long and careful deliberation on the part of the judges. A decision was rendered in favor of Geo. W. Magalhaes, who was formerly a student of Case School of Applied Science and later a graduate of the Columbia University. Mr. Magalhaes will start for St. Louis within a few days and remain in charge of the company's exhibit until the close of the fair.

Central American Notes.

LA LIBERTAD, C. A., October 6, 1904.—A large quantity of rails and other material will be required on the railroads running on the north coasts of Guatemala, Honduras and Nicaragua, since the recent cyclone destroyed them all and left the roadbeds in many places entirely under water. Millions have surely been destroyed along the Honduras Northern Railroad. This is a great fruit and mahogany region, the United Fruit Company alone having several lines of steamers plying to the district. The Government of Honduras is coming promptly to the rescue, and rebuilding will begin at once. If the American syndicate finally gets this line of railroad an entirely new route will be chosen to reach the interior of the country. At Puerto Barrios, Guatemala, not only the railroad suffered, but the buildings and warehouses were in many cases blown down. The owners now intend to replace them with iron and steel structures. It is reported that several of the large bridges on the Motagua & Rio Grande are down, but this is not certain yet, no telegraphic news from that region having come in for several days.

The Ocos Railroad and pier are now in German hands, and several shiploads of material for this line have arrived at the port. The extensions toward Mexico are building rapidly, but the new management says nothing about connecting with the Pan-American Railroad building southward. Had the American company finally taken hold this connection would have been a certainty. However, the Guatemala Central (the old Huntington line) has passed Sololá, Mazatenango and the adjoining coffee regions, and is now making for the northern border also, where, a little later, this connection is expected.

Since the revival of trade in Guatemala and Salvador quite an increase is shown in the importation of American plows, reapers and other farm machinery, bicycles, sewing machines, corrugated iron for earthquake proof buildings, iron and steel girders and tools, such as saws, machetes, spades and shovels.

A new line of small steamers is to ply between Amapala and San Lorenzo, La Brea and La Union (the last named on the mainland), and to be in connection with the Pacific, German & Pacific Steam Navigation Company's steamships. This company is pledged to continue its trips weekly from Valparaiso by the Panama and Central American ports north to San Francisco.

The attraction of the canal at Panama is bringing thousands to the isthmus and to Central America generally. Of course, there is but little to do in the immediate canal region as yet, all being preliminary work now, and many are finding work and profitable investments in the mines of gold, silver and copper, as well as the coffee, banana and rubber plantations in Salvador, Guatemala and Honduras. It is reported that the Honduras Government will soon sign a contract with an American company to work the Costa Norte iron deposits.

C.

The Iron Age

New York, Thursday, October 27, 1904.

DAVID WILLIAMS COMPANY, - - - - - - - - PUBLISHERS.
CHARLES KIRCHHOFF, - - - - - - - - - EDITOR.
GEO. W. COPE, - - - - - - - - - - ASSOCIATE EDITOR.
RICHARD R. WILLIAMS, - - - - - - - - - HARDWARE EDITOR.

The "Prince or Pauper" Industry.

The famous saying of Andrew Carnegie that the iron industry is "either a prince or a pauper" has been strikingly verified by the experience of the past two years. Up to the close of 1902 the iron trade had been so prosperous, and the outlook was so propitious, that even the most conservative began to wonder whether the time would ever come when manufacturers would find orders scarce and machinery rusting for lack of employment. The appetite for iron seemed insatiable. The opening months of 1903 were characterized by an actual pig iron famine on this side of the Atlantic, despite our greatly increased productive capacity. It seemed as if a new era had dawned, one in which the iron trade would find an ever-increasing demand sufficient to absorb the growth in output. The theory was gravely advanced that at last the iron trade had outgrown its subjection to spasms of activity and depression, partly through the strength of control exercised by large corporations and partly through the wider use of iron and steel by all nations. Some who should have been better informed went so far as to predict that the world's demands for iron and steel were destined to continue to expand until even the resources of this country would be constantly taxed to supply consumers in other lands.

From this dream of continuous trade came a rude awakening as 1903 unfolded its pages. Branch after branch of the iron trade experienced slackness in orders and diminishing interest among buyers until idle producing capacity exceeded that at work. The natural law of action and reaction was found to be still as effective as at any period prior. A depression almost as severe as any previously known spread throughout the country. Corporations whose dividends were thought to be secure found their earnings falling off, not merely 10 or 20 per cent., but from 50 per cent. up, and their stockholders were treated to explanations instead of dividends. The aftermath of this unpleasant turn in affairs is still being garnered. Reports of large manufacturing corporations dealing with this dismal period are coming out frequently. Within the past fortnight the Virginia Iron, Coal & Coke Company, the Crucible Steel Company of America and the Republic Iron & Steel Company have informed their stockholders of the results in the past fiscal year, covering the last half of 1903 and the first half of this year. The first named company reported a deficit of $30,000; the second a surplus of only $488,160, and the third a deficit of $254,188. Very comfortable surpluses had been earned by these companies in the preceding fiscal year. The Republic Company had then earned $2,740,900 above its preference dividend requirements and the Crucible Steel Company $1,522,550 over its similar requirements. The reports of these companies for their last fiscal year are merely typical, showing no worse results than those of a number of other manufacturing companies for the same period. In fact, their stockholders are to be congratulated that this season of depression did not bring with it insolvency, as was the case with some of their competitors.

Examining the recent reports of the Crucible Steel and Republic companies, the fact is forcibly demonstrated that their diminished profits were to a considerable extent due to one of the unavoidable risks of manufacturing—namely, depreciation in the value of stocks of materials. In the last half of 1903 the decline in prices of all kinds of materials used in manufacturing iron and steel was very heavy. The depreciation in the inventory of the Crucible Steel Company, due to this cause, was $695,640, and in that of the Republic Company it was $669,616. In the case of the latter company this loss through depreciation was sufficient to change a surplus into a deficit. That this has been the common experience of manufacturing companies is shown by other reports which have been published. The United States Steel Corporation, for instance, in its report for the year ended December 31, 1903, stated that $5,378,857.63 had been charged off "for depreciation in inventory and for adjustment of sundry accounts." It will be recalled that in 1894, when very few industrial corporations issued reports, the Illinois Steel Company reported that in the preceding year it had charged off $1,351,142.73 for depreciation in inventory, leaving a deficit for the year of $349,472.60. More than human foresight would be required in the management of any establishment making iron and steel on a large scale to avoid an occasional experience of this character. Immunity from such loss will only come when that ideal state of trade arrives in which business will be free from sharp fluctuations in prices.

The upturn in the demand for iron and steel which is now in progress promises better reports for the coming year. It seems reasonably certain that inventories will show no such depreciation as they did the past year. Increased demand also brings with it a better chance of profit in regularity of operation. The iron trade may not at once jump to its princely condition of 1899 to 1902, but it certainly should emerge from its pauperism.

Breaches of Trust by Employees.

The question of how far to extend his confidence to his employees is one that must at times engage the attention of the business man, as matters arise or processes are adopted which permit of no betrayal. He may have only a stenographer or a few clerks, or he may have hundreds of people in his employ, in his office and in his works. In any case, there are times when the betrayal of a business secret by a stenographer or clerk or a trade secret by a foreman or workman in the shop may mean the direct or indirect loss of a great deal of money. In this connection it is interesting to note recent instances where an employer of labor has had to ask the courts to intervene in his behalf to compel by injunction an employee to maintain the confidence that was reposed in him.

Under the important subject of master and servant the laws of the United States and England provide that an employer, the master, has the right to expect honorable treatment from the employee, the servant, in the matter of confidences. The contract made when a man or woman enters employment implies, so the law provides, that the master's secrets be kept. There are rascals in every calling, who would like nothing better than to betray the secrets of a former employer in order to ingratiate themselves with a new employer. The clerk who has access to the order book may provide a competitor of the recent employer with a valuable list of names. Or it may be a private schedule of costs or of prices and discounts.

The betrayal of business secrets is often a serious

matter. The modern business man cannot look after details himself. He has not the time. He has to trust his people. If the business is comparatively small, the managing officers may keep private books, which are supposed never to fall under the eye of employees, and they may themselves attend to correspondence, doing the work with pen and ink, or upon the typewriter, which latter accomplishment has been acquired by many men for this particular purpose. Yet if there be an inquisitive employee about the place he or she is apt to know a good deal more than the employer realizes, and if the inquisitive one is of the kind of stuff that would permit betrayal of knowledge obtained in such a manner the opportunity may offer in a new employment.

Few business men realize that they have protection under the law if they wish to avail themselves of it. A recent English case affords an excellent illustration of this right, and as it is brought under the laws of equity the same general principles apply in the United States. The question at issue was whether an employer has the power to protect himself against a breach of confidence on the part of his workmen. The plaintiff had employed a man named Marsh as correspondence clerk, who afterward went to one Turner who was in the same line of business. The plaintiff alleged that Marsh communicated to Turner the names of certain customers, and prayed for an injunction restraining Turner from acting on, and Marsh from giving, such information. Turner in his defense stated that Marsh had only suggested these names, and when he learned that the persons named were customers of the plaintiff he dismissed Marsh from his employ. The Court granted the injunction.

In another case, one Robb employed one Green, who, intending to set up in the same line of business, copied the names and addresses from Robb's order book, and when he had begun business used the names of these customers to get trade. The Court issued an injunction restraining Green from using the names, stating: "It is good law that a servant having left his master may, unless restrained by contract, lawfully set up in the same line of business as his late master, and in the same locality; and that he may, without fear of legal consequences, canvass for the custom of his late master's customers, whose names and addresses he has learned *bona fide* accidentally during the period of his service. But here we are dealing with a flagrant breach of trust during service, with intent to reap the advantage contemplated afterward. In such a case, too, it seems to me that the fraud in service with intent to use afterward, and the use afterward, are both discountenanced by law."

Another eminent judge, dealing with the question of trade secrets, has decided: "There is no doubt whatever that where a party who has a secret in trade employs persons under a contract express or implied, or under a duty expressed or implied, those persons cannot gain a secret and then set it up against the employer."

An eminent authority on this branch of the law states that "where an employer has machinery invented by him, but the nature of which and peculiarity of which he desires to keep secret, and of which desire on the part of the master the servant has notice at the time of his employment, even in the absence of an express contract on the part of the servant, the relations will be deemed confidential, and the law will imply a promise to keep his master's secrets thus committed to him, and any attempt on his part to use the secret for his own interests against his master, or to communicate to others or in any manner to aid others using it, will be a breach of his contract with his master, which will be enjoined by a court of equity." Probably the law would be useless in most cases, because the employer either does not learn the harm that a former employee is doing him, or else, while he may be morally certain that secrets of his business are being revealed to a competitor, he cannot prove it. Yet the law exists, and were it more generally known doubtless it would be more often used. The English laws go farther than the action in equity, in a provision of the Factory laws, which provides that the betrayal of a trade secret on the part of an employee is a misdemeanor, punishable by fine not exceeding 10 pounds, it making no difference whether the secret is furnished directly to the employee in question or to a fellow workman; and the same punishment may be meted out to the man who solicits such information from a workman. No such specific provision is made in this country. The workman may be enjoined, and under certain conditions he may be made liable for damages, but he is generally not financially responsible, and damages would mean little more than the name.

Fortunately, such instances of extreme breach of confidence are comparatively rare. But where an employee goes from one employer to another he is pretty apt to take with him all that he can in the way of knowledge of the business, that his services may be made as valuable as possible in his new position. Generally this may be done with complete honesty, the knowledge obtained and given being a legitimate part of a trade or occupation. The other sort of thing, the peddling of business and manufacturing secrets, occurs occasionally, and the real safeguard is not the law, but extreme care in selecting employees for positions of trust. The law is useful only as a last resort.

Activity in Lake Shipbuilding.

Chairman W. L. Brown of the American Shipbuilding Company announces that with the contract for four huge steel freighters, placed by the Pittsburgh Steamship Company October 20, practically every available berth for a new ship in the company's lake yards is taken up to the opening of navigation next season. The company now has on hand orders for 18 modern steel ships, none of which is less than 9000 tons, and some of which will exceed 10,000 tons. The total of new vessels will figure in the neighborhood of 175,000 tons of carrying capacity and represents an outlay of about $6,750,000 for new vessel property. Several more contracts are said to be pending.

Other shipyards on the lakes have taken a number of contracts for big ships. The Great Lakes Engineering Works, Detroit, has orders for seven boats, the combined total carrying capacity of which will be close to 70,000 tons and the cost approximately $3,250,000. This will nearly exhaust the capacity of that concern.

The Craig Shipbuilding Company, Toledo, besides other small contracts, will build an immense car ferry, costing $500,000, for the Grand Trunk Railway Company. The combined total of large craft for next season's delivery now amounts to 26 ships, with an aggregate carrying capacity of approximately 255,000 tons and a total valuation of $10,500,000.

Associated Foundry Foremen of Philadelphia and Vicinity.—A meeting of the Associated Foundry Foremen of Philadelphia and Vicinity was held at the Manufacturers' Club in that city on the evening of October 19. A permanent organization was formed, the following officers being elected to serve for one year: President, A. F. Williams; vice-president, James B. Strain; treasurer, Geo. M. Benkert; secretary, W. P. Cunningham. The membership was increased to 35, and after routine business had been transacted the meeting adjourned, to meet November 16 at the same time and place.

THE IRON AND STEEL INSTITUTE.

THE SECOND AMERICAN MEETING.

America has again welcomed that distinguished party of men which 14 years ago paid its first visit to this country—the Iron and Steel Institute. While the official welcome was extended to the foreign visitors in fitting form on Monday evening, it was anticipated the moment the distinguished visitors landed on American soil, for delegations of both the American committee and the New York Reception Committee were waiting on the pier to receive the guests with that hospitality which will continue until well into the middle of next month, when the last contingent of the foreign visitors will again set sail for their native shores.

The American reception really commenced on Sunday morning, when the main party arrived on the steamer "Celtic." The president of the institute, Andrew Carnegie, was with this party, and the salute of the American reception was fired when, as he and Mrs. Carnegie stepped to the shore, John Fritz, president of the General Committee, Bessemer medalist and honorary member of the Iron and Steel Institute, presented to Mrs. Carnegie a huge bunch of American Beauty roses.

Prof. Geo. W. Maynard, vice-chairman of the New York Local Committee, and who during the absence, through illness, of James A. Burden, the chairman of the New York committee, has been in complete charge of the New York arrangements, had provided cards containing information concerning places of divine worship in New York City, and parties were formed to attend the nearby churches. For the convenience of the guests, headquarters, which are located on the eighth floor of the Hotel Astor, were thrown open on Sunday, and here a most interesting reunion occurred between the American members and their associates from beyond the seas, who just 14 years ago paid their first visit to this country, and had not as a party visited America since. As a result of the excellent arrangements of the New York Local Committee, and the untiring efforts of Theodore Dwight, honorary secretary, who has taken a personal interest in all of the doings of the local committee, Monday was an extremely busy day, being taken up entirely by trips which offered both recreation and instruction to the visiting members.

THE EXCURSIONS.

Charles A. Moore acted as chairman of the New York Reception Committee, and Mrs. Roswell D. Hitchcock, as chairman of the Ladies' Committee, did admirable work in acquainting the visiting ladies with the wives, daughters and sisters of the local members and attending to their entertainment while in the city.

On Monday morning, through the courtesy of the Interborough Rapid Transit Company, special trains were placed at the disposal of members and their guests, enabling them to inspect the New York Subway. An inspection of the power station of the Interborough Company, the latest addition to the current generating services of Manhattan Island, was then made.

Simultaneously another party visited the plant of the Nichols Chemical Company, Laurel Hill, L. I. The members were much interested in the smelting, Bessemerizing and refining of copper, which they witnessed. The party was escorted by J. B. F. Herreshoff, general manager of the works.

In the afternoon the New York Navy Yard and the Waterside station of the New York Edison Company were visited. A steamer courteously tendered by the United States Navy left the pier at East Forty-second Street and East River at 2.30 p.m, and returning from the Navy Yard the steamer proceeded up the East River to the Waterside station of the New York Edison Company, Thirty-eighth street and East River, arriving about five o'clock, when the station was running under full load, and the members were enabled to witness one of New York's most interesting power stations, since the largest types of reciprocating engines and the steam turbine were seen in operation side by side.

Another party inspected the Hudson Tunnel Works. Through the courtesy of the New York & Jersey Railroad Company and its chief engineer, Chas. M. Jacobs, steamers were in waiting at the pier at West Thirty-fourth street, North River, at 2 p.m. En route to the tunnel the steamers stopped at Weehawken, N. J., to allow inspection of the New Jersey shaft of the Pennsylvania Railroad tunnels.

Another party also left headquarters at two o'clock and was met on the New York side of the Brooklyn Bridge by a special car and guides to allow the inspection of the interesting features of both the Brooklyn and Williamsburg bridges.

For the benefit of such members as preferred to visit lower New York City and inspect the Park Row Building, Thomas Robins had kindly consented to place at their disposal the facilities of the offices of the Robins Conveying Belt Company, which are admirably located in one of the towers of this building. Several members embraced this opportunity and on their return uptown they joined the other party at the Waterside station of the New York Edison Company.

On Tuesday morning an excursion was made to the United States Military Academy at West Point, N. Y.

The steamer "Monmouth," one of the best and fastest vessels on the Atlantic seaboard, had been provided through the courtesy of E. E. Olcott, chairman of the Transportation Committee, and the Central Railroad of New Jersey.

The New York committee provided a collation, which was served before the arrival at West Point. On the return trip tea was served.

The affair was voted as a most delightful function by all who attended.

THE OPENING SESSION.

The opening session of the Institute was held in the evening at Sherry's, Forty-fourth street and Fifth avenue.

Addresses of welcome were delivered by Chas. V. Fornes, acting Mayor of the City of New York; by John Fritz, Bessemer gold medalist, president of the American Reception Committee, and by James Gayley, president of the American Institute of Mining Engineers. C. Kirchhoff, chairman of the American Executive Committee, introduced the speakers.

On behalf of the Council of the Iron and Steel Institute Sir James Kitson, Bart., M.P., past president, presented to Andrew Carnegie, LL.D., the Bessemer gold medal.

The meeting was followed by a reception at the invitation of the New York Reception Committee, and there was dancing after 10 p.m.

In responding to Mr. Fornes' formal speech of welcome Mr. Carnegie, as president of the Institute, said:

On behalf of the iron and steel trades I beg to return grateful thanks for the exceedingly cordial welcome which you extend to us. Its warmth does not surprise us, for the Institute is no stranger to American hospitality. Fourteen years ago this very month we were your guests for the first time. Many then present are again your guests to-day. Among them, I shall be pardoned for mentioning our distinguished past presidents, Sir James Kitson, Bart., and Messrs. Martin, Richards and Whitwell.

The former then occupied the position of president, and I am sure you are delighted to see him again, for Sir James has become one of the important connecting links which serve to bind closer together the two branches of our English speaking race.

Upon our last visit the Institute was amazed at the extraordinary development it found, but they find to-day that, rapid as that was, development has proceeded at even a quicker pace since then. The figures are positively staggering. Your product of pig iron for the year we visited you, 1890, was 9,200,000 tons; in 1903 it was over 18,000,000 tons. Thus, in 13 years it has doubled. In Bessemer steel production more than doubled, and in open hearth steel the increase is more than elevenfold—from half a million tons in 1890 to six millions in 1903.

Your export trade in manufactures has increased nearly threefold. In the decade 1890 to 1900 you added 13,500,000 to your population, and the national wealth increased from $65,000,000,000 to $94,000,000,000. No

wonder we come to see for ourselves and to study such portentous growth.

There is one source of intense satisfaction open to our British members in doing so, for they cannot fail to remember, that while to you is to be credited the development of the iron and steel industry here, it is to their older land that you are indebted for the inventions which have rendered such wonderful development possible. To Cort and Nelson, Thomas and Gilchrist, Bessemer and Siemens you owe your success.

The two latter our German and French members may respectively claim as countrymen, and we of the three Teutonic branches and France are here allied as contributing partners to this achievement. The Institute congratulates the Republic upon this surprising increase, which we note with satisfaction. Your growth has not lessened the output of any other country. The demands of the world have increased quite as rapidly as all the iron and steel making nations have been able to supply them; and looking to the future, the question is not how various lands are to find a market for increased iron and steel production, but rather how the imperative demands of the ever increasing population for new developments of the world are to be met at reasonable prices. The needed supply of good ironstone is not by any means yet assured. We are compelled to base our hopes of increased supply of cheap steel on further discoveries.

This Institute has no narrow or selfish traits. The inventions and discoveries made in all these lands are promptly and fully explained at our meetings. The papers read at the last meeting illustrate this noble policy of publicity and mutual co-operation. Two leading manufacturers of armor plate described their latest processes and discussed their merits. We are all very proud of this feature.

To-day the statesmen of various powers now viewing each other with unfounded suspicion may take a lesson from the world-wide Iron and Steel Institute.

The presentation of the Bessemer medal to Mr. Carnegie was the last feature on the programme and the presentation speech was made by Sir James Kitson, Bart., M.P. Sir James, in his presentation speech, dwelt at length upon Mr. Carnegie's achievements in the iron and steel industry and spoke of a visit he made to the Pittsburgh steel works many years ago with Mr. Carnegie as his guide, when in response to a question Mr. Carnegie confessed that he did not understand the intricate machinery employed in the works, but said he did believe he understood the man who was behind the machinery and running it. Taking this as his text, Sir James spoke of Mr. Carnegie's general attitude toward inventors and others who had been of such vital importance in building up the iron and steel industry.

Mr. Carnegie, in accepting the medal, replied somewhat briefly, but with evident feeling, saying, among other things, that there were three kinds of men—the man who did great things and did not get credit for it, the man who did great things and did get credit for it and the man who got credit for about ten times more than he ever did, and to this last category Mr. Carnegie modestly consigned himself. He did give himself credit, however, for the possession of common sense and quoted the epitaph which several times he has said he wanted placed on his tomb—"Here lies one who knew how to get around him men cleverer than himself."

"I hope to hold this medal," he concluded, "and pass it on to my descendants as I receive it from you—pure gold and untarnished."

TECHNICAL SESSIONS.

The first session of the Institute was opened on Wednesday morning by the president, Andrew Carnegie, at 10 o'clock. After a few short words of hearty welcome Mr. Carnegie read a letter sent by Robert Abbott Hadfield, vice-president, setting forth his regret at not being able to attend the meeting. Mr. Carnegie then announced the fact that at its last meeting the council of the Institute had elected Mr. Hadfield to be its next president. In view of this fact it was voted to place his name upon the register of the meeting as a mark of courtesy and honor.

James Gayley presented his paper on "The Application of Dry Air Blast to the Manufacture of Iron," which we present elsewhere in this issue. Mr. Gayley supplemented his paper by explanatory remarks which were received with much interest.

The discussion was opened by E. Windsor Richards, who said in part:

I regret very much that I have not had time to read and study this most valuable and interesting paper. We are all aware that the blast furnace is a very sensitive instrument, and shows this very clearly, for in June, July and August a furnace does not dry so well, does not make the quality of iron, and requires more fuel. I consider that Mr. Gayley is on the right road to great success, and I hope that the apparatus will not be a very expensive one. I suppose it is too early for Mr. Gayley to let us know what the saving is likely to be. If we could produce pig iron considerably cheaper than we can at the present time it would be a very great advantage to our trade, which is at present, I know at least on the other side of the water, in a somewhat unremunerative condition.

I am sure that our warmest thanks are due to Mr. Gayley, as I think all, and I know some, of us have tried, and made experiments for the dessication of air for blast furnace purposes, and we have hitherto failed owing to the enormous quantity of air to be dessicated.

I think it seemed to be elected to Mr. Gayley to solve this most difficult problem, and I congratulate you and the Institute upon the valuable paper which he has contributed.

Mr. Carnegie called upon Dr. R. W. Raymond, honorary member, who, after referring to the fact that he had just secured a complete set of volumes of the proceedings of the Institute, in which the late Duke of Devonshire, the first president of the Institute, in his opening address, referred at length to the difficulties encountered in blast furnace practice at that time incident to the presence of moisture in the blast, said in part:

I have had, I believe, the widest experience among the American blast furnace managers—a wide experience of furnaces in trouble. I have had charge of furnaces which it seems could not keep out of trouble; but I have read pretty closely what is written on this subject on both sides of the water since the organization of the Iron and Steel Institute in 1869, and I tried to criticise some, and I have tried to prophesy some, and I am not afraid to say that Mr. Gayley has contributed this day one more of the great classics which adorn the records of this Institute.

I think the most important thing in this paper is the principle that uniformity is the first requirement, and that is brought out very clearly. It is not so important what the atmosphere is in winter or summer, but what the temperature is at 9 a.m. and 3 p.m. The great difficulty is that the air differs very much from hour to hour.

Mr. Carnegie called upon E. P. Martin, who said:

I regret that this paper was put into my hands but a few minutes ago. It is so full of what is true, and it bears out, as far as I have been able to follow Mr. Gayley to-day, very much that has been passing in my mind during the last 10 or 15 years with regard to the dessication of blast furnace air. That all of us know, or have felt the difference in the working of furnaces in the summer and in the winter there is no doubt, and I think Mr. Gayley has hit the nail on the head by finding out for us that to have any real benefit the dessication must be continuous and regular.

I think that is one of the points that later on, when we have a little more time to digest this paper a little more, will come prominently to the front.

John Fritz, in response to an invitation from the chair to comment upon Mr. Gayley's paper, said:

I can only tell you that this is one of the most important things that I know of in connection with blast furnaces. We never had the courage, nor did we have the money to do it, but it has now become a great commercial problem.

The great point is regularity, knowing she's working regularly, instead of having to get up at all hours of the night to investigate. I congratulate Mr. Gayley most heartily, it is a most worthy paper.

Edgar S. Cook of Pottstown, Pa., in relating his experiences in endeavoring to eliminate moisture from the blast, said:

We figured on accomplishing it by absorption, using chloride of calcium and drying out the silicon, but found that the cost to the structure would probably amount to more than the saving to the blast furnace, so we gave up in despair as we had not the means to carry it through. I think Mr. Gayley is deserving of every congratulation in having had the perseverance and the energy in carrying this thing through to successful issue, which he has already effected.

In the Schuylkill Valley, at Pottstown, my records show that with different seasons and different years the amount of water evaporated, or rather dessicated, in the blast furnace from a ton of iron has varied from 150 pounds of water to a ton of iron, up to 450 pounds to a ton of iron. Of course, seasons vary. August in one year may be different from August in another, and the moisture or humidity of the atmosphere in the East may be much more than it is in the West. We have frequently found from 10 to 11 grains of moisture per cubic foot of air in the atmosphere. And it is well known to all of you that moisture increases very rapidly—goes up to saturation—as the temperature of the air increases. Another disadvantage is this: The consuming interests seem to have the idea that all the blast furnaces are erected for is to give the consumer iron strictly at the cost of production.

This is the unfortunate part of Mr. Gayley's paper; it will add to the cost of our investment, which we will all have to do, and then we will be back to our original position so far as profits are concerned.

Mr. Fritz then interpolated: "I forgot to state one thing; that all of us have thought over this thing, and talked over it, but Mr. Gayley has done it."

Mr. Carnegie called upon Andrew Lamberton for his experiences in this connection in Scotland. He said:

I can only express the same regret which has been expressed by other speakers this morning, that this most interesting and valuable paper has only come into my hands a quarter of an hour ago. It is, I am sure, quite a revelation to many of us in this room to-day that this splendid development of blast furnace practice has come and proved such a success. It is just the thing, I think, that blast furnace managers were looking for; something that would cheapen the cost of production of pig iron, because in that course alone can I see any hope of future development.

The paper is to some extent technical, and it is quite a puzzle for any one on the spur of the moment to take up and discuss it in detail, and if Mr. Gayley had been able to tell us if this change, in the dessication of the air and the reduction of the moisture therein, has had the practical effect of making a saving during a run for a longer period, it would be interesting to know to what extent this was effected.

I can only say that this is just the kind of thing that our experience on this side might have almost led us to look for.

We come over here and we get our eyes opened on every side. And this morning I think I speak for a great many present, when I say that we have had a fine opening, indeed, through this new and fresh development of blast furnace practice, and I have great pleasure in giving my humble testimony to what I consider the great work Mr. Gayley has done for this industry.

After complimenting Mr. Gayley, A. Sahlin stated that by actual test it was found that the air inside of the engine houses at his plant contains considerably more moisture than does the atmosphere outside of the buildings. He agreed that to eliminate this from the blast would effect a marked saving.

E. H. Saniter, after coinciding with the views expressed concerning blast furnace practice, said:

The only other point is in reference to its application to the open hearth practice. It might be very useful, but I think at the same time that you will have to treat with the greater sinner—*i. e.*, producer gas—because this generally contains very much more moisture than the atmosphere. I believe the dryer the gas is the better heat you will get out of it.

In closing the discussion Mr. Gayley said:

There are many things in this process which, I think, we will find out later on. Our time has unfortunately been short in the experimental work. We may find that there are changes and, indeed, certain corrections to be made. When I spoke about the advantage of applying this process in a Bessemer converter I referred to the practice in this country, where the silicon with which we have to work is about 1 to 1¼ per cent. I quite agree that there would be an advantage if we were to reduce the silicon below ½ of 1 per cent.

I have a few things in connection with producer gas which I will contribute later on by communication to the secretary.

Mr. Carnegie announced the unanimous election to membership of 64 applicants. The morning session closed with the reading of the paper by H. H. Campbell of Steelton, Pa., on "The Influence of Carbon, Phosphorus, Manganese and Sulphur on the Tensile Strength of Open Hearth Steel."

At the afternoon session the reading of papers was to be continued. The New York Meeting closed with a banquet at the Waldorf-Astoria Hotel on Wednesday night.

On Thursday morning the party leaves New York for Philadelphia, a portion of the members visiting the plant of the Bethlehem Steel Company en route.

At Philadelphia the following Executive Committee will be in charge of affairs: William Sellers, Walter Wood, H. H. Campbell, James M. Dodge, Alfred J. Major, A. J. Moxam, Leonard Peckitt, John Birkinbine, Edwin S. Cramp, Stanley G. Flagg, Jr., Decourcy May, Frank C. Roberts and W. R. Webster. Joseph Wharton is chairman of the Philadelphia General Reception Committee.

Among those in attendance are the following foreign members of the Institute:

C. Allen, Sheffield.
W. E. Allen, Sheffield.
E. G. Appleby, Leicester.
Thomas Atherton, Warrington.
C. H. F. Bagley, Stockton.
A. Bain, Glasgow.
W. R. Bates, Alfreton.
Prof. H. Bauerman, London.
T. R. Bayliss, Birmingham.
W. F. Beardshaw, Sheffield.
H. Birkbeck, London.
A. W. Blackwell, Liverpool.
G. G. Blackwell, Liverpool.
C. E. Bloomer, Halesowen.
J. E. Alger Blyde, Sheffield.
Edwin Bond, Birmingham.
A. Booth, Leeds.
Wm. Booth, Leeds.
Wm. Bright, Gowerton.
B. J. Broadway, Birmingham.
C. E. Bunch, Warrington.
J. M. Burnup, London.
R. W. Burnyeat, Workington.
H. Butler, Halifax.
W. H. Butlin, Wellingborough.
Thos. Campbell, Glasgow.
T. Carlisle, Maryport.
W. Carter, Manchester.
E. C. Chalas, London.
A. Chalas, London.
P. Chamfrault, Saulnes.
E. D. Cleghorn, Manchester.
A. Colley, Bilston.
Lieut.-Col. J. H. Cowan, London.
N. Cradock, Wakefield.
R. D. Croall, Midlothian.
P. N. Cunningham, Glasgow.
J. C. Custodis, London.
B. A. Daly, Dornoch.
W. S. Davie, Coatbridge.
Harry Davies, Neath.
W. H. Davies, Stoke-on-Trent.
H. S. Downe, London.
E. Dreux, Mont. St. Martin.
E. J. Duff, Liverpool.
J. Duffield, Cockermouth.
N. Duffield, Cockermouth.
G. R. Dunell, London.
J. Dunnachie, Coatbridge.
C. K. Everitt, Sheffield.
E. Farnworth, Wolverhampton.
John Fellows, Cradley Heath.
A. Firth, Sheffield.
D. Flather, Sheffield.
Sir Walter Foster, M. P., London.
G. E. Fox, Bristol.
G. Watson Gray, Liverpool.
J. Hardisty, Chesterfield.
W. A. Hartley, Sheffield.
W. R. Hay, London.
A. P. Head, London.
W. Hill, Newcastle, Staffs.
A. J. Hobson, Sheffield.
H. E. Hodgson, Cleckheaton.
Wm. Hodgson, Halifax.
A. Horsfield, Wakefield.
S. E. Howell, Sheffield.
Herbert Hughes, Sheffield.
J. G. W. Humfrey, Stourport.
Samuel Huxley, Pontypool.
C. W. James, Leeds.
Thos. Jenkins, Perry Barr.
C. L. Jones, London.
E Peter Jones, Wolverhampton.
A J. Jordon, Sheffield.
T B. Mackenzie, Motherwell
R. C. McKerrow, London.
C. F. MacLaren, Wishaw.
W. S. B. McLaren, London.
G. Macmillan, North Berwick.
Jules Magery, Namur.
Maurice Magery, Aix-la-Chapelle.
P. J. Mallmann, London.
E. P. Martin, past-president, Abergavenny.
Hugh Martin, Coatbridge.
Bergrat Maurer, Hanover.
W. H. Massey, Twyford.
H. Mechan, Glasgow.
A. C. Meyjes, London.
J. T. Middleton, London.
S. Vaughan Morgan, London.
J. Moore, London.
C. T. Needham, Manchester.
D. M. Nesbit, London.
F. Noake, Wolverhampton.
T. Noda, Sheffield.
H. Owen, Warrington.
J. Paterson, Workington.
V. Pendred, London.
A. E. Pettit, Weybridge.
J. Proctor, Salop.
A. S. Pye-Smith, Sheffield.
J. Raine, Newcastle-on-Tyne.
B. M. Renton, Sheffield.
E. Windsor Richards, past-president, Caerleon, Mon.
David E. Roberts, Cardiff.
W. B. Roberts, Leeds.
Leslie S. Robertson, London.
Sydney J. Robinson, Sheffield.
T. B. Rogerson, Glasgow.
F. T. Rollin, Sheffield.
R. Russell, Newmains.
A. Sahlin, London.
E. H. Saniter, Rotherham.
F. Sauer, London.
F. Scharf, West Bromwich.
P. Schmidt, Hanover.
H Kilburn Scott, London.
E. G. Sehmer, Malstatt-Burbach
George E. Senior, Sheffield.
A. G. Service, Glasgow.
R Sharp, Workington.
L. P. Sidney, London.
H. C. Simpson, Wellington.
D. T. Sims, Neath.
Enos Smith, Cleckheaton.
G. H. Smith, Halifax.
R. Sneddon, Wishaw.
E. M. Speakman, Knutsford.
E. Steiger, London.
S. E. Stevens, Doncaster.
Sir David Stewart, Aberdeen.
C. B. C. Storey, Lancaster.
E Storey, Liverpool.
T. W. P. Storey, Mostyn.
S. J. Summerson, Darlington.
T. Symington, Coatbridge.
B. Talbot, Leeds.
H F. Taylor, Briton Ferry.
Hubert S. Thomas, Llanelly.
F. Timmermans, Liége.
John Timms, Barrow-in-Furness.
J. E. Touch, London.
William Tozer, Sheffield.
A. Turnbull, Bishopbriggs.
H. G. Turner, London.
T. Turner, Kilmarnock.
J. Verity, Mexborough.
A. Vosmaer, de Bilt, Holland.
W. F. A. Wadham, Dalton-in-Furness.

R. W. Kennard, Abergavenny.
James Kerr, Motherwell.
J. Kidner, Kettering.
Sir James Kitson, Bart., M. P., past-president, Leeds.
R. D. Kitson, Leeds.
W. Kutzlenchal, London.
A. Lamberton, Coatbridge.
L. N. Ledingham, Sheffield.
A. J. Ledwith, Kidderminster.
John Lees, Handsworth.
John Bayley Lees, Handsworth.
A. Lennox Leigh, Doncaster.
David Lewis, Gorseinon.
W. R. Lewis, Gorseinon.
J. Little, Sheffield.
J Livesey, London.
F. H. Lloyd, Lichfield.
J. F. S. Lloyd, Lichfield.
A. H. Longden, Nottingham.
D. A. Louis, London.
D. C. Lysaght, Newport, Mon.
C. Macdona, M. P.
H. H. Wake, Sunderland.
R. Wallwork, Manchester.
M. Wardlow, Sheffield.
H. C. Waterston, Coatbridge.
H. B. Weeks, Barrow-in-Furness.
Dr. A. Weiskopf, Hanover.
T. Westgarth, Middlesbrough.
G. H. White, Swansea.
W. Whitwell, past-president, Saltburn-by-the-Sea.
F. H. Wigham, Wakefield.
F. D. Wild, Sheffield.
T. Wilkinson, Sheffield.
Wilfred Williams, Birmingham.
R. Williamson, Cockermouth.
R. S. Williamson, Hednesford.
G. P. Wincott, Barrow-in-Furness.
Sir Lloyd Wise, London.
J Wood, Wigan.
W. W. Wood, Jr., Sheffield.
R. G. Woodward, Sheffield.
S. Young, London.
Heinrich Zix, Dortmouth.

Pennsylvania Railroad Foundry Improvements.

The Pennsylvania Railroad Company's foundry plant at South Altoona, Pa., when completed will rank among the largest in the world and it is claimed that none will surpass it in equipment. The buildings will all be nearly finished by the first of the year. The cost of erection will run close to $1,500,000, the site alone costing $45,000. The car wheel foundry is practically finished and is expected to make a trial heat this week. It will have a capacity of about 800 wheels a day. There will be three double cupolas, and two of them have been set up and are ready for service. The annealing ovens, the cooling pits and the core ovens have all been completed and tracks have been laid through the various parts of the building for convenience in handling materials.

The power plant connected with the works is about finished. Everything will be operated by electricity. The scale house, where all the material will be weighed, is completed, and bricklayers are now engaged on the erection of the office building, the store and sand houses. They are making good headway and in a short time the structures will be under roof.

The work of building the gray iron foundry is now well under way, as the foundations have been completed and the steel which will be used in its construction is already on the ground. It is expected that the work will have progressed so far before cold weather sets in that work on the interior can be started and hurried to completion. Preparations have also been made for the beginning of the erection of the pattern shop, the brass foundry and other smaller shops that will be connected with the foundries. This plant is located about 2½ miles from the old foundries.

Niagara Falls Power at Toronto.—In less than a year every street car in Toronto will be propelled by power from Niagara Falls. The Toronto Street Railway Company has a contract with the Niagara & Toronto Power Company to furnish all the power it may require for the operation of its lines, and a large force of men is now engaged in building the transmission line via St. Catharines and Hamilton.

The Firth-Sterling Steel Company, E. S. Jackman, agent, Chicago, announces that that agency has secured for another year the services of C. C. Worrall and F. N. Mead. Mr. Mead will sell in northern Illinois, Wisconsin, Iowa, Minnesota and Montana. Mr. Worrall will sell in Nashville, Tenn.; Louisville, Ky.; Indianapolis, Richmond and other cities in southern Indiana.

Martin Kingman, president of the Kingman Plow Company and Kingman & Co., Peoria, Ill., and affiliated companies in other cities, has replied to the bill of C. A. Jamison, who asked that a receiver be appointed for the Kingman interests, the reply denying the charges of the plaintiff and stating that most, if not all, of the acts of the company to which he objects were made with his knowledge and consent while he held the position of general manager of the companies.

National Metal Trades Association Notes.

CINCINNATI, OHIO, October 24, 1904.—The St. Louis Metal Trades Association reports that with one exception all the requisitions for mechanics were filled by its labor bureau. The Curtis & Co. Mfg. Company, which has been operating all of its departments excepting the saw department on the open shop plan, has now determined to operate it on the same principle. The annual meeting of the St. Louis Metal Trades Association will be held some time in November, the date to be fixed by the executive board at its next meeting. The molders' strike in St. Louis has about subsided, and all of the struck foundries are running along very satisfactorily.

The pamphlet entitled "Testimonials Upon the Work of the National Metal Trades Association" is causing much favorable comment, especially as regards the emphatic terms in which the writers state that all employers should affiliate themselves with the association.

Judging from the responses received all the members of the Administrative Council of the National Metal Trades Association will be present at the meeting to be held on the 27th and 28th inst., in the association's offices, Union Trust Building, this city. Secretary Wuest, who has been confined to his home with a severe attack of sciatic rheumatism, is able once more to be on duty.

At a meeting of the Administrative Council to be held this week will come up several important matters that will demand attention. One of the most urgent is a change proposed to Article 8 of the by-laws.

W. P. Eagan has just returned from a prolonged tour of the East, where he had the pleasure of meeting the members of the associations. At Worcester, Mass., a dinner was given on October 11; at Springfield, Mass., on October 13, and a smoker by the Manufactrurers' Association of Hartford County, at Hartford, Conn., on October 17, and a dinner by the Boston Metal Trades Association on October 19. At all of these places Mr. Eagan preached the gospel of the National Metal Trades Association, and inaugurated the preliminary campaign that he has in contemplation. He reports that in all places where he visited general business conditions were much better, and that there was a more hopeful feeling existing. Mr. Eagan is planning his campaign on somewhat different lines than have been followed heretofore in disseminating the truths of the association. He takes the ground that every manufacturer throughout the entire country who has to do with members of the metal trades unions should contribute to the cost of the everyday fight against the further encroachments and aggressions of those unions, which fight, every manufacturer who has followed the development of unionism concedes, must be made. That unless these unions are opposed they will extend their field of aggression to cover the entire country, and will put upon manufacturers such conditions and limitations as will result in an utter inability to maintain the industrial supremacy which now belongs to this country. It is the centralized power of these unions that makes them effective, and the same sort of organization must oppose them. He further maintains that it is a far better proposition for a manufacturer of Hartford to contribute to the cost of resisting this fighting organization in a locality remote from Hartford than to take the risk of their being successful in that remote locality, when it is absolutely certain that such success will signalize the beginning of hostilities in other and untouched fields. Every union with which the National Metal Trades Association has to deal is of national scope, and the workmen all over the country are prepared to contribute toward the expense of all fights.

The American Tube & Stamping Company, Bridgeport, Conn., will not appoint a special manager of its open hearth department and billet mill, or east side plant, but will conduct the business for that department through its superintendent, W. R. Palmer, who was for about 20 years, until recently, with the Cleveland Rolling Mill Company. Mr. Palmer will be in charge of the operating department and office at that plant, with all sales and purchases for the department made by the company's officials at its main office at its west end works, thus concentrating the handling of the business.

OBITUARY.

THOMAS M. POLLOCK.

Thomas M. Pollock, a pioneer iron manufacturer of the Mahoning Valley and one of the best known and most highly esteemed citizens of Youngstown, Ohio, died October 12 from heart failure, aged 66 years. He was born in Pittsburgh, Pa., but went to Youngstown at the age of 16 and obtained employment at the Phœnix furnace, one of the first blast furnaces of the valley and a part of the old Brown-Bownell plant, where he worked as an engineer. His industry and intelligence caused him to be quickly promoted and in 1861 he was appointed manager of the Eagle furnace at Brier Hill, which position he held until 1884. Ill health then compelled him to retire from business and he went West in 1888 to improve his physical condition, but he never fully recovered. Mr. Pollock and his brothers were all natural born mechanics and the mechanical genius was strong in Thomas M. Pollock, who spent a great deal of time and effort in study and original investigation. When poor health made it impossible for him to engage in active business he turned his attention to the improvement of blast furnaces and invented a number of useful and valuable appliances, several of which are in use in modern furnaces. He was actively engaged in religious and philanthropic work and his death is widely felt by many who had participated in his beneficence. He is survived by his brothers William B. and John S. of Youngstown and Robert of California, as well as by one daughter.

NOTES.

WILLIS E. MILLER, president of the Henry Hooker Carriage Company and the Ives & Miller Company, New Haven, Conn., makers of carriage axles, died October 18, aged 65 years.

MARVIN R. WARNER, senior member of the firm of M. R. Warner & Son, hammer manufacturers, Cromwell, Conn., died October 18, aged 81 years.

OLIVER P. DICKINSON, credit manager for the Crane Company, Chicago, Ill., died in that city on October 6, after an illness of several weeks. He was a graduate of the University of Michigan, and was formerly vice-president of the Merchants' National Bank of Kansas City, Mo.

W. F. KERNAHAN, a well-known business man of the Mahoning Valley, died on October 19 at Warren, Ohio, after a long illness, at the age of 69 years. Mr. Kernahan was born in Guernsey County, Ohio. He was identified with a large number of business firms, including the Warren Electric & Specialty Company, the Warren Mfg. Company, Hanson & Kernahan and Kernahan & McCormick, all of Warren; the Baldwin-Kernahan Company, Youngstown, Ohio, and the Girard Boiler & Mfg. Company, Girard, Ohio.

COLONEL J. C. FULLER, a well-known Pennsylvania iron and railroad man, died October 19 at his home at Pine Grove Furnace, Cumberland County, Pa., aged 77 years. He was born in Massachusetts and went to Pennsylvania in the year 1871. For a number of years he conducted the iron works at Pine Grove, but of late he had devoted most of his time to the superintendence of his large land interests in that section of the country.

TOM ALMGILL, who for nearly 25 years had represented the G. & H. Barnett Company, Philadelphia, proprietor of the Black Diamond File Works, died suddenly, October 18, in his 48th year. Mr. Almgill was well known to the leading hardware concerns, he having been accustomed to covering the principal jobbing points in the country from Maine to California. Mr. Almgill was also a familiar figure at many of the trade conventions in which his company was interested.

WILLIS E. MILLER died at New Haven, Conn., October 18, aged 65 years. He was president and treasurer of the Henry Hooker Carriage Company, New Haven, and was identified with the Ives & Miller Company, Mt. Carmel, Conn., manufacturer of carriage axles.

EBENEZER B. BEECHER, who died recently at Westville, Conn., occupied a prominent place in the evolution of machines for making matches, by a number of inventions, including the famous stick setting machine which revolutionized the industry. Others of his inventions were the stick cutting machine, the rolling off machine, the composition mixing and dipping machine, the box making machine and the shuck making machine, all of which are in use by the Diamond Match Company.

WALLACE T. FOOTE, long one of the most prominent iron manufacturers in the country, died at his home in Fort Henry, N. Y., October 19. He was born in Middlebury, Vt., on March 18, 1825. He inaugurated modern blast furnace practice in the United States by the erection in 1855 of the first iron stack furnace. This he followed shortly after with the introduction of the closed hopper top. Mr. Foote was a director of the first railroad which penetrated the Champlain Valley, and after his retirement from the iron business became interested in paper manufacture and was president of a ban.k

CHARLES R. BLAKE, president of the Sligo Iron Store Company, St. Louis, Mo., died in that city October 20, in his fifty-ninth year, after a long illness. He was born in Cincinnati, educated in Gambier, Ohio, and learned the hardware business in Plattsburgh, N. Y. He was connected with a hardware house in Alton, Ill., for ten years and went to St. Louis in 1877, where he became identified with the Sligo Iron Store Company. He is survived by a widow and five children.

PERSONAL.

Clement F. Street has been appointed commercial engineer of the Westinghouse Electric & Mfg. Company to handle work in connection with steam railroads. Mr. Street is an engineer of high rank and is well qualified to take charge of this important branch of the Westinghouse work. His latest field of activity has been with the Wellman-Seaver-Morgan Company, Cleveland, Ohio, in the important capacity of manager of the railroad department, which position he has just resigned to accept this one of still greater responsibility with the Westinghouse Electric & Mfg. Company.

John A. Stevens, vice-president of the National Lead Company, in charge of the sales department, has resigned in order to accept a similar position with the United Lead Company. Evans McCarty, general superintendent of manufactures of the Atlantic branch of the National Lead Company, has also transferred his services to the United Company. In view of the failure of negotiations for the merger of the two corporations, and rumors of more active competition between the rival companies, these changes are of especial interest.

United States Shipbuilding Plants Sold.—On Tuesday the Harlan & Hollingsworth plant of the United States Shipbuilding Company at Wilmington, Del., was bid in by George R. Sheldon of New York, representing the Reorganization Committee, which has now secured all the nine plants. The following are the amounts paid for the several properties: Bethlehem Steel Company, South Bethlehem, Pa., $7,500,000; Union Iron Works, San Francisco, Cal., $1,700,000; Crescent Shipyard, Elizabeth, N. J., $150,000; Samuel L. Moore & Sons Company, Elizabeth, N. J., $205,000; Canda Mfg. Co., Carteret, N. J.. $200,000; Eastern Shipbuilding Company, New London, Conn., $145,000; Bath Iron Works, Bath, Me., $340,000; Hyde Windlass Company, Bath, Me., $225,000, and Harlan & Hollingsworth, Wilmington, Del., $685,000. Add to these figures $50,000 which was paid for the property mortgaged to the Mercantile Trust Company of New York, and it will be found that the United States Shipbuilding property was sold for $11,200,000, against which was issued $20,000,000 in preferred and common stock and $9,000,000 in bonds, a total of $29,000,000. The capital stock of the subsidiary companies has not yet been sold. Mr. Sheldon's bid of $200,000 for the stock was not deemed satisfactory and the receiver refused to sell it. It was to be offered for sale again on Wednesday of this week.

MANUFACTURING.

Iron and Steel.

The new blast furnace of the La Belle Iron Works at Steubenville, Ohio, is nearly completed and will be blown in early in November. This stack, which will be known as No. 2, is 20 x 90 feet in size and is equipped with four Massicks & Crooke hot blast stoves, each 21 x 85 feet, and which were installed by George W. McClure, Son & Co., Bessemer Building, Pittsburgh, who are sole builders of this type of stove in this country. This new stack is expected to turn out about 450 tons of iron per day, and No. 1 stack makes about the same amount, so that the La Belle Iron Works, when the new furnace is started, will be in position to make practically all the pig iron needed in its open hearth steel plant.

The Cherry Valley Iron Company, Pittsburgh, will shortly complete the rebuilding of its furnace at Leetonia, Ohio. The new stack is 18 x 80 feet, as compared with 17 x 75 feet, the size of the one torn down. With the completion of the work this company will have practically a new plant. Last year three Massicks & Crooke stoves were built to take the place of the old stoves, which did not have sufficient capacity. The stoves are 21 x 85 feet. In addition 100 coke ovens have been built, making a battery of 200 ovens at the furnace, giving a sufficient output to provide all the coke required.

The Lackawanna Steel Company will make an important change in its construction department in the near future by the substitution of natural gas for coal and coke as fuel in its furnaces. Test wells have demonstrated that there is a plentiful supply of gas in the vicinity of the company's plant at Stonypoint, Buffalo. The Reserve Gas Company has been organized, composed of a number of New York and Pennsylvania oil and gas operators, and several hundred acres of land have been leased at West Seneca, where sufficient wells will be drilled to supply the steel company and other consumers. Wm. H. Argue of Buffalo is president of the new gas company.

At a recent meeting of the Board of Directors of the Philadelphia & Reading Coal & Iron Company, Philadelphia, the officers were re-elected.

The Edwards Mfg. Company, Cincinnati, Ohio, with factories in Cincinnati, Ohio, and Covington, Ky., reports business exceptionally good in all departments. The company makes a specialty of corrugated iron roofing and galvanized iron conductor pipe and eave trough, and is prepared to furnish sheet metal building material of every description. A new catalogue showing the complete line will be sent on application.

The Thomas Furnace Company, Milwaukee, Wis., has just completed the erection of a new Massicks & Crooke stove 18 x 75 feet, and has added 180 x 200 feet to its former ore dock. The furnace has been relined and equipped with a new hearth and bosh. A new slag pit, 25 x 30 feet, to be served by a 5-ton Pawling & Harnischfeger crane, is now in process of construction, as is also a new steel cast house, 60 x 180 feet, which is being erected by the Modern Structural Steel Company of Waukesha, Wis. This casting house, which will be served by a 5-ton Pawling & Harnischfeger crane, will embody some novel ideas not hitherto in use which will tend to reduce the cost of separating pigs from sows and breaking and loading the pig iron. President Thomas expects to blow in the stack about November 10.

The Eagle Horseshoe Company, South Milwaukee, Wis., has recently made important additions and enlargements to its plant for the manufacture of iron bars, horseshoes and kindred products.

Sweet's Steel Company, Williamsport, Pa., has a large number of orders on its books and will put its mills on partial night turn next week and full night turn within a couple of months. Another train of rolls is to be added to the rolling mill.

The Chrome Steel Works, manufacturer of chrome steel shoes and dies and other fixtures for gold and silver stamp mills, also welded steel and iron plates for safes and vaults, which has been located in Brooklyn, N. Y., for a great many years, has removed to Chrome, N. J., where an extensive plant covering several acres has been installed.

Official announcement is made that the Portland Iron & Steel Company, Portland, Maine, has rebuilt its works and is again rolling iron. The product is merchant bar iron, bolt iron, rolled shafting, &c.

William Y. Cruikshank has been appointed receiver for the Salmon Iron Company, Freeland, Pa. The company was capitalized at $40,000.

A deal has been consummated whereby the Alabama Steel & Wire Company acquires possession of the properties of the Underwood Coal Company located at Altoona, Ala. The purchase price is nearly $300,000 on a cash basis. This puts the Alabama Steel & Wire Company in possession of a connecting link between its holdings in Alabama. Its steel mills and furnace are located at Gadsden, while its rod and nail mills are at Ensley. The new coal property is between the two and will furnish fuel for all the plants.

Blast Furnace No. 3 of the Carnegie Steel Company, at South Sharon, Pa., which was recently completed, will be blown in at an early date. The furnace has a daily capacity of about 400 tons.

The recent increase in a capitalization of $125,000 by the Baldt Steel Company, New Castle, Del., was for the purpose of concluding the construction of its new plant as originally intended and to provide the company with sufficient working capital. The company is preparing to get its product on the market at as early a date as possible. The machinery requirements were covered some time ago.

Mary Furnace of the Ohio Iron & Steel Company, at Lowellville, Ohio, which has been idle for some time undergoing repairs, is expected to blow in on Monday, October 31. This stack is 18 x 85 feet in size and has a daily capacity of about 350 tons of Bessemer or chilled basic pig iron, and sometimes runs on special grades of foundry iron known as "The Mary" or "The Mary Ohio Scotch." Robert Bentley is secretary and general manger of the concern.

General Machinery.

The Philadelphia Pneumatic Tool Company, Philadelphia, Pa., has completed plans for a new blacksmith shop at Twenty-first street and Allegheny avenue.

The Vilter Mfg. Company, Milwaukee, Wis., builder of engines and refrigerating machinery, has just made a two-story brick addition to its office and is fitting its entire machine shops with concrete floors instead of wood. The company recently shipped a complete mechanical outfit for two mints of the Chinese Government, one at Tientsin and the other at Shanghai, each with a 250 horse-power Corliss engine and two 150 horse-power return tubular boilers, in addition to generators, motors and special machinery.

The John T. Abbott Machinery Company, Ft. Worth, Texas, has recently been incorporated with $20,000 capital stock for the purpose of handling machinery and supplies. John T. Abbott is president; Adam H. Herdman, vice-president; Adrian Bronquist, secretary and treasurer.

The Atchison, Topeka & Santa Fé Railway Company is making a six-stall addition to its present roundhouse at Newton, Kan., and erecting a brick tank shop 20 x 64 feet, also installing a new heating equipment for shop buildings. The cost of these improvements approximates $16,000. Nelson & McLeod, 84 La Salle street, Chicago, are general contractors.

The Pratt Chuck Company, Frankfort, N. Y., contemplates enlarging its works in the spring.

O'Neill Water Heater Mfg. Company, Peoria, Ill., is planning to enlarge its facilities in order to keep pace with the increasing demand for its water heaters. The firm wishes to correspond with firms handling plating material, planished and sheet copper, sheet tin, copper tubing, gray iron castings, glass water gauge tubes, wood and paper packing boxes and general machinery and tools, as well as with die makers, copper spinners and brass finishers.

The shops and yards of the Atlantic & Birmingham Railroad at Waycross, Ga., are being enlarged. New machinery for the additions has been secured and will be installed as soon as the buildings are completed.

The sale of the American Clay Working Machinery Company's plants at Bucyrus and Willoughby, Ohio, has been postponed until November 17 for want of bidders. No bid of less than $350,000 will be approved.

Power Plant Equipment.

A new steam turbine embodying radical new principles is being perfected by Charles Backstrom of Milwaukee, and two companies have been formed for the exploitation of this turbine. One, the Backstrom & Smith Steam Turbine & Mfg. Company, which has several millions of dollars back of it, which includes in its membership Charles Backstrom, W. O. Smith, T. J. Neacy and Walter Read; and the other the Backstrom Mfg. Company, with the same owners, which will have control of the foreign business of the company. All the members of the firm except Mr. Smith are also members of Filer & Stowell Company, which company will do the active construction work on the turbines until a time when the magnitude of business will warrant the erection of a separate plant. Further particulars on this turbine are withheld until patents are issued, which will be in the near future. Reference was made to this matter in our issue of October 6.

The Brown Corliss Engine Company, Corliss, Wis., has just received orders for one 20 x 42 inch heavy duty Corliss engine, for the Grand Rapids Desk Company, Muskegon, Mich.; one 16 and 26 x 16 inch vertical compound noncondensing high speed engine; one 13 and 22 x 12 inch vertical compound noncondensing high speed engine, both being connected for electric lighting service, and one 9 x 9 inch single cylinder high speed engine, for the city of Columbia, Mo.

The Payne Engineering Company, 26 Cortlandt street, New York, has enlarged its plant at Elmira, N. Y., increasing the facilities greatly. In addition to its line of high grade engines the company is going into the manufacture of castings.

Hugh J. Reilley, Jr., New York, has secured the contract for the construction of a new water works for Bordentown, N. J., at his bid of $66,157. There is to be a tower of concrete 100 feet high on which will stand a steel tank 40 feet high.

The Cutler-Hammer Mfg. Company, Milwaukee, Wis., recently had occasion to purchase electric equipment for its works. As manufacturers of starters, controllers and rheostats the Cutler-Hammer Mfg. Company disposes of its product to most of the manufacturers of electric machinery in the country. Therefore its position in buying electric machinery was of necessity very delicate, in order that none of its customers might feel offended. After taking propositions from the competing manufacturers of electric apparatus the company proposed to the bidders to refer the selection of the make to a committee of distinguished consulting engineers. It was finally decided to place the matter in the hands of the well-known consulting engineers, Sargent & Lundy of Chicago, who after due consideration and deliberation awarded the order to the Northern Electrical Mfg. Company, Madison, Wis., as in their opinion the best type of electrical machinery for industrial plant service. The order consisted of a 75-kw. and a 37.5-kw. generator.

John V. Rice, Jr. & Co., Bordentown, N. J., have incorporated under the same name. The company builds high class marine gas engines, gasoline rock drills, boat and automobile engines, &c.

Dodge & Day, engineers, Philadelphia, Pa., have just been commissioned by the Conkling-Armstrong Terra Cotta Company, makers of architectural terra cotta, to engineer the rebuilding and re-equipping of its plant at Wissahickon avenue and Juniata streets, Philadelphia, Pa., lately destroyed by fire. The increase in the power plant of the Jeanesville Iron Works Company, Hazleton, Pa., also engineered by this firm, contemplates the installation of a 75-kw. De Laval steam turbine generator. The equipping of the additional switchboard panel will be done by Walker Electric Company, Philadelphia, Pa. This firm will also install some 400 horse-power Westinghouse motors, ranging in speed from 5 horse-power to 150 horse-power, in the new plant of the Victor Talking Machine Company, Camden, N. J., as well as an Albro-Clem electric operated freight elevator, having a lifting capacity of 7600 pounds at a speed of 40 feet per minute.

The Whitehead Machinery Company, Davenport, Iowa, has secured a contract for boiler, pump, feed water filter, traps, pipes, fittings, &c., for the United States Indian School, Fort Totten, N. D.

The reorganization of the Vance Boiler Works, Geneva, N. Y., has been perfected, and the plant is in full operation, working night and day. At a recent meeting of the Board of Directors Bernard Borgman was elected president and treasurer; James R. Vance, vice-president, and Thomas H. Sweeney, secretary.

The Toledo, Bowling Green & Southern Traction Company of Findlay, Ohio, is preparing to erect a large central power station in that city. Plans prepared by E. Darrow, the company's consulting engineer, call for the purchase of three 1500 horse-power cross compound condensing engines, to run at 94 revolutions per minute with 175 pounds steam pressure. These will be direct connected to three 1000-kw. 25-cycle alternating current generators, with apparatus for 33,000 volt transmission. A contract has just been placed with McIntosh, Seymour & Co., Auburn, N. Y., for the three 1500 horse-power engines.

The James Leffel Company, Springfield, Ohio, has received a large order for turbines for shipment to Mexico. They are to be used in an electric light and power plant.

Foundries.

The Filer & Stowell Company, Milwaukee, Wis., is delaying the completion of its new foundry, which is about 1 mile distant from its present plant, until the city of Milwaukee affords proper street car service to the new plant. The transfer of castings from the new foundry to the old plant will be done over a private railway line owned and operated by the company. The present foundry at the old plant will be transformed into an erecting shop as soon as the new foundry is occupied.

J. A. & P. E. Dutcher Company, Milwaukee, Wis., manufacturer of steel castings, has recently completed a new foundry building, 60 x 125 feet, built with steel skeleton and tile facing, and has added a 200-foot Christianson air compressor and a 70 horse-power electric generator. The company is now taking figures on the erection of a new open hearth furnace for steel castings, which will be added to the present equipment in order to accommodate the increase of its business.

The Steubner Iron Works, Long Island City, has purchased a site on Vernan avenue, between Eleventh and Twelfth streets, where the foundry will be moved from Third street and the Long Island Railroad. The new plant to be erected will have a much larger capacity than the present one and will consist of a two-story brick building, 100 x 180 feet, with an open court in the center and an extension 50 x 180 feet. Adjoining the shops will be a storage shed 30 x 200 feet. The equipment now in use will be moved into the new buildings, and it is not likely that much, if any, new machinery will be required.

At the annual meeting of the stockholders of the Andrew Terry Company, Terryville, Conn., on Monday afternoon, October 24, the following were elected a Board of Directors for the ensuing year: Charles Purrington, Edgar L. Pond, Charles A. Allen, George C. Clark and Jonathan Starr, all of Terryville. Subsequently the directors elected the following officers: President, Edgar L. Pond; secretary and treasurer, George C. Clark.

Bridges and Buildings.

The Northwestern National Life Insurance Company is erecting an office building in the city of Minneapolis to cost about $375,000. Bertrand & Chamberlin of Minneapolis are the architects. The Minneapolis Steel Company has a contract for furnishing the structural iron work and H. N. Layton & Co., Minneapolis, are the contractors.

The McClintic-Marshall Construction Company of Pittsburgh, with works at Rankin Station and Pottstown, Pa., has secured some large structural contracts. Among these is the new Wabash freight depot in Pittsburgh, requiring about 4000 tons; four large steel buildings for the Youngstown Iron Sheet & Tube Company, at Youngstown, Ohio, which will contain the threading department, gas producers, lap weld department and power house; also the building of a distributing plant for the Ontario Power Company, at Niagara Falls, Ontario, Canada, involving about 500 tons.

Fires.

The plant of the Bridgeport Boiler Mfg. Company, Bridgeport, Conn., was damaged to the extent of $8000 by a fire October 19.

The George Malone Implement Company's shops at Marion, Ohio, were destroyed by fire October 24. The loss is placed at $25,000.

The factory of the Lyndhurst Sandpaper Company, at Lyndhurst, N. J., was burned October 19, causing a loss of $16,000

The tannery of F. Krehl & Sons, at Girard, Ohio, was destroyed by fire October 23. The loss is estimated at $250,000.

The harness and saddle manufacturing establishment of E. Renkopf & Co., Paducah, Ky., was burned last week. The loss is placed at $50,000.

The American Lead Pencil Company's works at Lewisburg, Tenn., were destroyed by fire October 24, entailing a loss of $50,000.

A fire supposed to have been caused by spontaneous combustion did $100,000 damage to the plant of the New Home Sewing Machine Company, Orange, Mass., on October 24.

The thread mill of E. J. Currie, at Keyport, N. J., was destroyed by fire October 25. The loss is placed at $12,000.

Hardware.

The Cutler Nail Company, Ashland, Mass., manufacturers of horseshoe nails, has recently added to its equipment 15 sets of machines. These machines are of a new design and complete the nail in three operations.

The Rundle Mfg. Company, Milwaukee, Wis., reports business as very active, that it is running three shifts a day and has an excess of orders ahead. The specialties include plumbers' hardware and castings. At present the company is building two new enameling ovens, making five in all.

Ivory Handle Company, Hope, Ark., manufacture axe, adze, pick, sledge, hatchet, hammer and mining tool handles of what is referred to as a superior grade of second growth hickory peculiar to that section of the country. The company states that it has been located at Hope for the past three years and is selling its product throughout the United States and in several European countries.

The Fisk Rubber Company, Chicopee Falls, Mass., has been reorganized under Massachusetts laws with authorized capital stock of $600,000, the incorporators being Alfred N. Mayor, Harry G. Fisk and Harry T. Dunn, all of Springfield. An extensive addition is being built to the plant. The company will continue, for the present at least, the lines previously manufactured, automobile, bicycle and carriage tires of the pneumatic type.

The Housatonic Mfg. Company, New Haven, Conn., will be reorganized, according to the plan as stated by Col. R. S. Woodruff, receiver of the business. Mr. Woodruff reports that the receivership has demonstrated that there is an apparent profit in the business. At the present time nearly 200 hands are continuously employed in the manufacture of plated goods of various kinds, especially cutlery.

The Crescent Handle Works, Evansville, Ind., which has been manufacturing D handles for the shovel trade for some years past, has been gradually equipping the plant to bend and rivet them, also for the production of long handles, and is enjoying an excellent demand from the hardware trade.

Miscellaneous.

Fels & Co., Philadelphia, Pa., are to build a two-story addition to their plant, 80 x 118 feet. The company makes soap.

The J. I. Case Threshing Machine Company, Racine, Wis., has recently bought a large tract of ground near the city of Winnipeg, Man., the land including the site of Fort Williams. It is understood that it is the company's intention to erect a factory on this tract of ground for the manufacture of threshing machines for the Canadian and British-American trade.

The Milwaukee Coke & Gas Company has increased its capital stock from $750,000 to $1,000,000. The company is meet-

ing with much success in the sale and distribution of the output of the new Semet-Solvay coke plant, which has a capacity of 500 tons of coke a day. This coke is sold not only to foundries and furnaces, but for domestic consumption as well.

S. K. Hamilton and M. F. Dickinson have been appointed receivers for the Jefferson Mfg. Company, whose plant is located at Lexington, Mass.

The Sterling Pin Company, Derby, Conn., is to remove to larger quarters at Shelton, Conn., where it has leased a plant.

The Miscellaneous Machine Company, New York, recently incorporated, will manufacture popular priced phonographs, moving picture machines, &c. For the present the company will use an existing plant, but later expects to build new works. Address J. J. Farnsworth, 6 West Twenty-second street.

The stockholders of the Pittsburgh Reduction Company, Pittsburgh, have voted to increase the capital stock from $1,600,000 to $3,800,000.

The Conductor Money Changer Company, Toledo, Ohio, has been incorporated with $10,000 capital stock by Sam T. Fisk, S. F. Fisk, Charles R. Clapp, K. R. Risor and Arthur Longbrake. The company will establish a factory in Toledo for the manufacture of a patent money changer for street railway conductors and collectors.

The Hoffman Steam Heater Company, Lorain, Ohio, has leased the building formerly occupied by the Lorain Wrench Company. It will manufacture an improved type of steam and hot water heater. The plant, which is one of the largest in the city, will commence operations as soon as possible.

The Cleveland Metal Roofing & Ceiling Company, Cleveland, has been awarded the contract for the sheet metal work for the new 18-story Rockefeller Building in that city. This company has also secured the contract for the sheet metal work and roofing for a large building being erected at Jamestown, N. Y., by Lawson & Gusstafson, general contractors.

The Universal Electric Sign Company, Cleveland, will erect a $25,000 brick and steel factory building at Superior and North Perry streets, that city.

The Enterprise Carriage Works Company, Miamisburg, Ohio, will add to its plant by the erection of a four-story building, 53 x 200 feet. Additional iron and wood working machinery for carriage building will be purchased.

George W. Wagoner of Stoney Ridge, Ohio, will erect a large grain elevator on the Lake Shore & Michigan Southern tracks in Toledo. It will be constructed of concrete, stone, brick and iron, and it will be equipped with rope drive, steel buckets and a car loading spout, with blower attachments, so that cars may be loaded by the use of air.

The Viking Vehicle Parts Company, Akron, Ohio, has been incorporated with $10,000 capital stock. The incorporators are Orlando Wilcox, Cecil Crane, H. Hinman, D. E. Wier and F. B. Burch. The company will erect a factory at Akron for the manufacture of wagon and carriage parts.

The United States Horse Shoe Company, Erie, Pa., has purchased most of the equipment for its new plant. The contract for the buildings went to the McClintic-Marshall Construction Company, Pittsburgh, Pa. Nagle Corliss engines will be used and the rolling trains will be furnished by the Lewis Foundry & Machine Company, Pittsburgh.

The Simplex Railway Appliance Company, New York, has purchased 43 acres in Lachine, Canada, upon which it will build large works for the manufacture of its specialties and steel cars. The company has a plant in Montreal and will move the equipment into the new works as soon as the buildings are completed, so that it is not likely that very much new machinery will be required. There will, however, be some purchases of equipment made, but the matter will not be given much consideration for some time to come.

Bartlett, Hayward Company, Baltimore, Md., have built what is claimed to be the largest gas tank in the world, which is now in service at Astoria, N. Y. The tank is 300 feet in diameter, and its hight when fully inflated is approximately 275 feet. The capacity is 15,000,000 cubic feet of gas.

The Crucible Steel Company of America.—The annual meeting of the directors of the Crucible Steel Company of America was held in the Frick Building, Pittsburgh, on October 24, at which the following officers were elected: Frank B. Smith, president and general manager; Reuben Miller, first vice-president; Herbert Du Puy, second vice-president; Charles E. Clapp, fourth vice-president; Alexander Thomas, secretary, and Julius Bieler, treasurer. Executive Committee: William G. Park, chairman; Frank B. Smith, J. Denniston Lyon, James H. Park, Reuben Miller, Herbert Du Puy and A. W. Mellon. Only one change was made among the directors, this being the substitution of J. Denniston Lyon for W. P. Snyder, who declined re-election. Mr. Lyon will represent the minority stockholders.

The United States Steel Corporation's Quarterly Earnings.

The statement of earnings for the third quarter, issued by the Board of Directors after its meeting on October 25, shows net earnings of $18,773,932. Judge Gary, chairman, made this statement after the close of the meeting:

"The recovery in the steel and iron industry has been most marked since the opening of October. Our bookings of orders are now about 26,000 tons a day, or about 30⅝ per cent. larger than a year ago. This increase in demand did not set in in earnest until the opening of the current quarter and the orders on hand at the close of the last quarter did not, accordingly, reflect the improvement in the steel industry. Orders are now coming in freely, however."

The surplus for the quarter is $1,312,988, as shown by the following table:

Total net earnings		$18,773,932
Less appropriations for the following purposes—viz.:		
Sinking funds on bonds of subsidiary companies	$417,883	
Depreciation and reserve funds	3,800,317	
		4,218,200
Balance		$14,555,732
Deduct:		
Interest on U. S. Steel Corporation bonds for the quarter	$5,925,325	
Sinking funds on U. S. Steel Corporation bonds for the quarter	1,012,500	
		6,937,825
Balance		$7,617,907
Dividend for the quarter on preferred stock of United States Steel Corporation, 1¾ per cent		6,304,919
Surplus for the quarter		$1,312,988

The unfilled orders on hand on October 1, amounting to 3,027,436 tons, compare with 3,192,277 tons on July 1, 4,136,961 tons on April 1, 3,215,123 tons on January 1, 3,728,742 tons on October 1, 1903, and 4,843,007 tons on October 1, 1902.

The net earnings for the nine months ended September 30, in three years, compare as follows:

	1904.	1903.	1902.
First quarter	$13,208,886	$25,068,707	$26,715,457
Second quarter	19,490,725	36,642,308	37,662,058
Third quarter	18,773,543	32,422,955	36,945,489
Nine months	$51,473,543	$94,133,970	$101,323,004

The Naval Architects' Meeting.—The Society of Naval Architects and Marine Engineers will hold its twelfth general meeting in New York City, beginning at 10 o'clock a.m., November 17, 1904. Through the courtesy of the president and managers of the American Society of Mechanical Engineers the meetings will be held in the auditorium of 12 West Thirty-first street. Following is a list of the papers to be read at this meeting: "Simple Methods in War Ship Designs a Necessity," by George W. Dickie; "The Semiglobular Naval Battery," by Anson Phelps Stokes; "The Seagoing Battle Ship," by Commander Wm. Hovgaard, Royal Danish Navy; "Some Further Notes on the Performance of the Torpedo Boats of the United States Navy at Sea," by Lieutenant Commander L. H. Chandler, United States Navy; "The Position of the Center of Lateral Resistance," by L. E. Bertin; "Some Recent Experiments at the United States Model Basin," by Naval Constructor D. W. Taylor, United States Navy; "Coaling of War Ships at Sea," by Spencer Miller; "Time Allowance for Steam Yacht Races," by ex-Engineer in Chief George W. Melville, United States Navy; "The Rules of Lloyd's Register for Building Yachts to Class," by George Stanbury; "The Shipping and Shipbuilding of Puget Sound," by Frank W. Hibbs; "Maintenance of Machinery in Merchant Ships," by Robert Haig; "High Speed Gasoline Launches," by Clinton H. Crane; "Speed and Power of Recent Motor Boats," by Alpheus A. Packard; "Recent Launching Practice of the Atlantic Coast," by Assistant Naval Constructor R. H. M. Robinson, United States Navy; "Recent Launching Practice of the Pacific Coast," by Everett P. Lesley.

The Iron and Metal Trades

Southern Pig Iron producers seem to have gauged the market correctly when they advanced their prices to what appeared to be prohibitory figures. The rising tide of the demand has been sufficiently strong to carry Northern prices up to a parity with Southern, and all sections have thus enjoyed a share of the heavy buying movement the past week. Sales are reported on the basis of $12, Birmingham, for No. 2 Foundry, which two weeks ago would have been considered completely out of the question. Even this price, however, does not tempt the makers to book much business for next year's delivery. In fact, the Northern as well as the Southern Pig Iron makers are chary about taking contracts running far into next year because of the outlook as to Coke and Ore. It is quite certain that Coke will not be procurable at the low prices ruling the past summer, and it is also asserted that the Lake Ore shipments this year will not allow for much expansion of production by merchant blast furnaces during the winter.

While large foundry interests have been heavy buyers of Pig Iron, the greatest blocks have been bought by Steel makers, particularly the manufacturers of Plates, whose trade has been so decidedly improved by the numerous orders recently placed for Steel cars and lake vessels. Nevertheless, the foundries have done very well in the market, and now Cincinnati reports that the Cast Iron Pipe makers are inquiring for a very large tonnage. One machinery builder bought 20,000 tons the past week.

The improved condition of trade in finished products is demonstrated by the quarterly report of the United States Steel Corporation, whose earnings for the third quarter are much above what had been expected about July 1, and whose chairman states that the bookings now are running up to 26,000 tons a day, or over 30 per cent. more than they were at the corresponding time last year.

The only branch of Steel manufacture now really lagging is the Rail trade, which will continue quiet until the price for next year is settled. No time has yet been fixed for a meeting of the manufacturers.

In sympathy with the course of the Pig Iron market, prices on Old Materials have shown quite an advance during the week.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

	Oct.26, 1904.	Oct.19, 1904.	Sept.28, 1904.	Oct.28, 1903.
PIG IRON:				
Foundry Pig No. 2, Standard, Philadelphia	**$14.75**	$14.50	$14.25	$15.25
Foundry Pig No. 2, Southern, Cincinnati	**13.75**	13.00	12.00	12.75
Foundry Pig No. 2, Local, Chicago	**14.50**	13.50	13.50	15.50
Bessemer Pig, Pittsburgh	**13.60**	13.10	12.85	15.85
Gray Forge, Pittsburgh	**12.85**	12.25	11.75	14.00
Lake Superior Charcoal, Chicago	**15.50**	15.25	14.75	17.50
BILLETS, RAILS, &c.:				
Steel Billets, Pittsburgh	19.50	19.50	19.50	27.00
Steel Billets, Philadelphia	**22.00**	22.00	21.50	27.00
Steel Billets, Chicago	22.50	22.50	22.50	27.00
Wire Rods, Pittsburgh	26.00	26.00	26.00	34.00
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00
OLD MATERIAL:				
O. Steel Rails, Chicago	**11.50**	11.00	11.00	12.50
O. Steel Rails, Philadelphia	**14.00**	13.00	12.25	13.50
O. Iron Rails, Chicago	**17.50**	16.50	16.00	17.00
O. Iron Rails, Philadelphia	**17.00**	16.50	15.50	17.00
O. Car Wheels, Chicago	**13.00**	12.00	11.00	18.00
O. Car Wheels, Philadelphia	**13.00**	12.50	12.00	16.00
Heavy Steel Scrap, Pittsburgh	**12.50**	12.50	11.50	14.50
Heavy Steel Scrap, Chicago	**11.50**	11.00	10.00	12.00
FINISHED IRON AND STEEL:				
Refined Iron Bars, Philadelphia	1.43½	1.43½	1.43½	1.50
Common Iron Bars, Chicago	**1.40**	1.35	1.35	1.45
Common Iron Bars, Pittsburgh	1.30	1.30	1.30	1.45
Steel Bars, Tidewater	1.44½	1.44½	1.44½	1.70
Steel Bars, Pittsburgh	1.30	1.30	1.30	1.60
Tank Plates, Tidewater	1.54½	1.54½	1.54½	1.78
Tank Plates, Pittsburgh	1.40	1.40	1.40	1.60
Beams, Tidewater	1.54½	1.54½	1.54½	1.73½
Beams, Pittsburgh	1.40	1.40	1.40	1.60
Angles, Tidewater	1.54½	1.54½	1.54½	1.73½
Angles, Pittsburgh	1.40	1.40	1.40	1.60
Skelp, Grooved Steel, Pittsburgh	**1.35**	1.30	1.30	1.45
Skelp, Sheared Steel, Pittsburgh	**1.40**	1.35	1.35	1.60
Sheets, No. 27, Pittsburgh	2.00	2.00	2.00	2.50
Barb Wire, f.o.b. Pittsburgh	2.05	2.05	2.05	2.60
Wire Nails, f.o.b. Pittsburgh	1.60	1.60	1.60	2.90
Cut Nails, f.o.b. Pittsburgh	1.60	1.60	1.60	2.15
METALS:				
Copper, New York	**13.37½**	13.12½	12.75	14.00
Spelter, St. Louis	**5.20**	5.15	5.00	5.55
Lead, New York	4.20	4.20	4.20	4.40
Lead, St. Louis	4.20	4.20	4.12½	4.27½
Tin, New York	**28.70**	28.82½	27.85	25.75
Antimony, Hallett, New York	**7.12½**	7.00	7.00	6.25
Nickel, New York	40.00	40.00	40.00	40.00
Tin Plate, Domestic, Bessemer, 100 pounds, New York	3.49	3.49	3.49	3.99

Chicago.

FISHER BUILDING, October 26, 1904.—(*By Telegraph.*)

With the comparative quiet of last week was the calm before the storm, and to-day prices on Pig Iron and Old Materials range from $1 to $1.50 higher than they were last week, and there is a strong upward tendency that may make them another dollar higher before this item is read. Buyers still profess to believe that this is but a momentary fever that will end in collapse, but sellers herald it as the arrival of the long expected boom and predict that it will be not many weeks until blast furnaces are full up with business and out of the market, with buyers vainly clamoring for materials which cannot be had. The advance in the raw materials, if maintained any length of time, will necessitate an advance on finished products all along the line, and already there is much talk about considerably higher prices in Steel and Iron Bars and Wire, to say nothing of heavier products. It is even predicted of Plates, which have been weak and in slow demand, that before January 1 every Plate mill will have booked orders for its full capacity. This prophecy is predicted largely upon the heavy tonnage of Steel vessels which will be built during the winter and upon the increased demand for Steel cars. Bar Iron is firm at 1.40c. and Bar Steel at 1.46½c., with heavy specifications coming in from implement makers and car builders and other interests. Southern Pig Iron producers are actually getting the $12, base price, which looked so absurd two weeks ago, and are booking large business on that basis. Northern producers have advanced $1 to $1.50 since last week's quotations. Old Materials are from $1 to $1.50 higher than they were a week ago, and dealers are scrambling for materials which railroads and other producers are offering them, though nearly all the actual consumers of Scrap are either well supplied or are holding off under the impression that the present prices are fictitious and

will go to pieces shortly. It now develops that railroads have been much larger buyers than the public surmised, and that many of their purchases have been made in a quiet way. Even the Coke market is considerably stronger and some interests are talking of withdrawing from the market because their tonnage is sold for some months to come.

Pig Iron.—One of those lightning changes which makes Iron either a prince or a pauper has taken place in this market almost over night. Southern producers who have been holding for $12, a figure that was met with derision by buyers, have carried the day, and are now selling large tonnages for delivery the first half of next year on this basis. Northern producers, the moment they assured themselves that their Southern rivals had been victorious, advanced their prices in sympathy, and are now holding at from $14.50 to $15, Chicago, with 50c. advance for the first quarter of next year. This advance has been the signal for feverish buying on the part of consumers whose empty yards testify to their disbelief in higher prics. Already a number of Northern producers claim to be out of the market because they are sold up, and it is predicted that it will be only a short time before the entire producing capacity of the country will be booked, and that producers will have great difficulty in securing deliveries in time for their requirements. The Southern carrying roads met to-day and decided to reaffirm present freight prices extending to March 1. This means $3.65 from Birmingham to Chicago, and $2.65 from Virginia furnaces. The new prices on Pig Iron at this moment for delivery this year are given below, the wide spread between high and low prices indicating the different views of sellers as to their minimum. Prices for the first quarter of 1905 and in some cases the first half rule about 50c. higher at present with an upward tendency. We quote:

Lake Superior Charcoal	$15.50 to $16.00
Northern Coke Foundry, No. 1	15.00 to 15.50
Northern Coke Foundry, No. 2	14.50 to 15.00
Northern Coke Foundry, No. 3	14.00 to 14.50
Northern Scotch, No. 1	15.50 to 16.00
Ohio Strong Softeners, No. 1	15.80 to 16.30
Ohio Strong Softeners, No. 2	15.30 to 15.80
Southern Silvery, according to Silicon	16.40 to 16.90
Southern Coke, No. 1	15.65 to 16.15
Southern Coke, No. 2	15.15 to 15.65
Southern Coke, No. 3	14.65 to 15.15
Southern Coke, No. 4	14.40 to 14.65
Southern Coke, No. 1 Soft	15.65 to 16.15
Southern Coke, No. 2 Soft	15.15 to 15.65
Southern Gray Forge	14.15 to 14.65
Southern Mottled and White	13.40 to 14.15
Malleable Bessemer	14.50 to 15.00
Standard Bessemer	15.25 to 15.75
Jackson County and Kentucky Silvery, 6 to 10 per cent. Silicon	18.30 to 19.30
Alabama Basic	15.15 to 15.65
Virginia Basic	15.15 to 15.65

Billets.—A fair consumptive demand for Billets is in evidence at all times, and the new prices on Forging Billets seem to be maintained generally by producers allied in the pool. Prices are unchanged, as follows: 4 x 4 and larger up to but not including 10 x 10, $24.50; 10 x 10 and larger, $26.50; less than 4 x 4, $26.50. Some makers charge $4 above the 10-inch price for Billets 20 inches and larger. The renewed activity in shipbuilding on the Great Lakes and car building in Western car works, together with a general betterment in business, is stimulating the demand for Billets quite appreciably.

Rails and Track Supplies.—Both Standard Section Rails and Light Sections are quiet. What orders there are are rush orders placed by companies that must make repairs to their present equipment or from new lines that are desirous of laying their Rails before the approach of cold weather. Light Section Rails go at from $20 to $22, at mill, and Standard Sections are unchanged, of course, at the $28 basis. Spikes and Splices are active, with prices unchanged, Bars being quoted at from 1.30c. to 1.35c.; Spikes at from 1.60c. to 1.65c., in car lots; Track Bolts, 2.20c. to 2.25c., base, from mill, with Square Nuts, and 10c. to 15c. extra for Hexagon Nuts. Store prices on Angle Bars, Track Bolts and Spikes are about 15c. above mill prices.

Structural Material.—We have had another quiet week in Structural Materials, but hopes of producers are kept high by the large prospective business that is being figured on for Chicago buildings and by the increasing demand for Channels and Angles among builders of cars and Steel vessels. Official prices are unchanged, as follows: Beams and Channels, 3 to 15 inches, inclusive, 1.56½c., Chicago; Angles, 3 to 6 inches, ¼-inch and heavier, 1.56½c.; Angles, larger than 6 inches on one or both legs, 1.66½c.; Beams, larger than 15 inches, 1.66½c.; Zees, 3 inches and over, 1.56½c.; Tees, 3 inches and over, 1.61½c., with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. Store prices on Structural Materials are 1.80c. to 1.90c. for Angles, Beams, Channels and Zees, base sizes, with 1.90c. to 2c. for 18, 20 and 24 inch Beams; Tees, 1.85c. to 1.95c. These prices are for either random lengths or cut to lengths.

Plates.—While it is evident the tonnage demanded for new ships on the lakes and for large orders for pressed Steel cars is quickening the operations at the mills and leading to liberal specifications on contracts, it is equally in evidence that there is very little business being placed in the Chicago market by the consumers at large. Demand from boiler shops, structural shops and bridge works and the like is only fair. Warning is being sounded by producers that it may be wise for consumers to get their orders for Heavy Plates on the books of the mills before the railroad, car and ship building demand monopolizes all available tonnage. Association prices are unchanged, as follows: Tank quality, ¼-inch and heavier, wider than 24 and up to 100 inches wide, carloads, Chicago, 1.56½c.; 3-16 inch, 1.66½c.; Nos. 7 and 8 gauge, 1.71½c.; No. 9, 1.81½c.; Flange quality, any width up to 100 inches, 1.66½c.; Sketch Plates, in Tank quality, 1.66½c.; in Flange quality, 1.76½c. Store prices on Plates are as follows: Tank Plates, in width up to 100 incnes, ¼-inch and heavier, 1.75c. to 1.85c.; 3-16 inch, 1.85c. to 1.95c.; Nos. 8 and 10, 1.90c. to 2c.; Nos. 12 and 14, 2c. to 2.10c.; No. 16, 2.10c. to 2.20c.; Flange quality, 25c. per 100 lbs. extra.

Sheets.—This commodity is one which is almost always first to be affected by the unfavorable market conditions and the last to recover. A somewhat firmer feeling pervades the market, but it has not reached a point where prices have stiffened perceptibly. As there is no uniformity in mill prices in the matter of differentials between gauges, the prices named below may be taken only as a general guide to mill quotations, car lots, Chicago, 5c. and 10c. per 100 lbs., higher or lower, being named by some mills on any one of the gauges, according to the magnitude and character of the order. Present Chicago prices in car lots are about as follows: Nos. 9 and 10, 1.66½c.; Nos. 11 and 12, 1.71½c.; Nos. 13 and 14, 1.76½c.; Nos. 15 and 16, 1.86½c.; Nos. 18 to 20, 2.01½c.; Nos. 22 to 24, 2.06½c.; Nos. 25 and 26, 2.11½c.; No. 27, 2.16½c.; No. 28, 2.26½c.; No. 29, 2.36½c.; No. 30, 2.46½c. Store prices are: Nos. 8 and 10, 1.90c. to 2c.; No. 12, 1.95c. to 2.05c.; No. 14, 2c. to 2.10c.; Nos. 15 and 16, 2.10c. to 2.20c.; Nos. 18 and 20, 2.20c. to 2.30c.; Nos. 22 and 24, 2.30c. to 2.40c.; Nos. 25 and 26, 2.35c. to 2.45c.; No. 27, 2.45c. to 2.55c.; No. 28, 2.55c. to 2.60c.; No. 29, 2.70c. to 2.80c. Galvanized Sheets show no change since last week, being offered at from 80 and 7½ to 80 and 10 discount, Pittsburgh, carload lots and larger, and selling from store here at 75, 10 and 5 and 75, 10 and 7½ discount from list.

Bars.—Specifications on contracts are growing in volume to a point where mills are unable to meet the demands of their customers. Considerable new business also is being placed. The market is strong both in Iron and Steel Bars, and sharp advances are predicted for the near future. The pyrotechnic advances of the past few days in Pig Iron and Scrap have strengthened the tone of the Bar Iron market to a point where it is strong at 1.40c. There is as yet no change in the price of Steel Bars, and the market is firm at 1.30c., base, Pittsburgh, or 1.46½c., Chicago, for Soft Bessemer Steel Bars, and 5c. higher for Open Hearth, with the usual 5c. extra for less than car lots, and the usual extras for less than 1 ton of a size. Soft Steel Hoops are 1.71½c. rates, full extras; Soft Steel Channels, Angles and Tees, smaller than 3 inches, 1.70c. to 1.75c., base, half extras; Bar Iron, 1.35c. to 1.40c., base, half extras. Store prices at Chicago warehouses are: Soft Steel Bars and Bands, 1.65c. to 1.70c., base, half extras; Soft Steel Angles, Channels and Tees, 1.75c. to 1.80c., base, half extras; Iron Bars, 1.70c. to 1.75c., base, full extras; Steel Hoops, 2.10c. rates, full extras.

Merchant Steel.—Specifications on contracts are being received in increasing volume. The general tone of the market, influenced by the encouraging consumptive demand on one hand and by the increasing cost of raw materials on the other, is strong, with an upward tendency. We quote: Open Hearth Spring Steel to general trade, 1.85c. to 1.90c.; Smooth Finished Machinery Steel, 1.71½c. to 1.76½c.; Smooth Finished Tire, 1.66½c. to 1.71½c.; Flat Sleigh Shoe, 1.51½c. to 1.56½.; Concave and Convex Sleigh Shoe, apparently unchanged at 1.66½c. to 1.71½c.; Cutter Shoe, apparently unchanged at 2.25c. to 2.30c.; Toe Calk Steel, 2.01½c. to 2.06½c.; Crucible Tool Steel, 6½c. to 8c.; special grades of Tool Steel, 13c. and up; Shafting at 5% per cent. in car lots and 47 per cent. in less than car lots; Railway Spring, carload lots, 1.71½c. to 1.86½c., with reductions for larger quantities.

Merchant Pipe.—The leading producer of Pipe has advanced prices by making discounts on Iron and Steel, Black and Galvanized, in all sizes one point lower throughout the list. This averages an advance of about $2 a ton on the net cost of all sizes of Pipe.

Boiler Tubes.—There is no change in the Boiler Tube situation nor in the prices, which are fairly well maintained at the following discount basis for less than car lots, Chicago delivery, with two points higher discount for car lots:

	Steel.	Iron.	Seamless Steel.
1 to 1¼ inches	46.35	41.35	52.35
1¾ to 2¼ inches	58.35	41.35	40.35
2½ inches	60.35	46.35	43.35
2¾ to 5 inches	66.35	53.35	up to 4 in. 50.85
6 to 13 inches	58.35	41.35	....

Store business has some elements of encouragement in it, and the following price-list would prevail for ordinary small lots from store, with additional inducements for round lots:

	Steel.	Iron.	Seamless Steel.
1 to 1¼ inches	42½	37½	40
1¾ to 2½ inches	52½	35	37½
2½ inches	55	37½	40
2¾ to 5 inches	62½	47½	47½
6 inches and larger	52½	35	..

Cast Iron Pipe.—Notwithstanding the rapid advances in the price of Southern Iron which enters largely into the manufacture of Cast Iron Pipe, makers have not yet advanced their prices, but state that it will be necessary for them to do so if present high figures for Iron are maintained any length of time. There has been no business of any magnitude placed within the week and none is expected until after January 1, when municipalities will begin figuring on their spring requirements. Prices are still on the basis of $25.50 for 4-inch Water Pipe, $26.50 for 6-inch and heavier, and $1 extra for Gas Pipe. These prices, however, will be shaded on very large lots.

Old Material.—The speculative fever which broke out in this market some months ago and which has been maintained ever since with higher or lower temperatures has broken out afresh and has advanced prices all the way from 50c. to $1.50 a ton since last week. Part of this advance is due to the fact that many dealers are short and are hurrying to cover. Meanwhile it is estimated that there is enough material in the yards of dealers and producers in this market to keep every mill busy for the next six or eight months, and that it will be out of the question for the speculators to market their product to consumers at anything like the prices quoted below. One thing is certain, makers of Bar Iron cannot buy their raw materials at these prices and sell their product at present figures without incurring a loss. The Chicago, Burlington & Quincy Railroad closed sales yesterday for about 4000 tons of materials at prices higher than has been paid in this market since last winter. The upward turn in the market of Old Materials is also ascribed to the sudden advance in Pig Iron, and this feature gives it more stability than it could otherwise have, making it more than possible that prices may go even higher. We advance Old Iron Rails, $1; Old Steel Rails, 75c. and $1; Heavy Relaying Rails, $1; Old Car Wheels, $1; Heavy Melting Steel, 50c.; Mixed Steel, $1; Iron Fish Plates, $1.25; Iron Car Axles, $1.50; Steel Car Axles, $1; No. 1 Railroad Wrought, $1.25; do. No. 2, $1.25; Shafting, 50c.; No. 1 Dealers' Forge, 50c.; Wrought Pipe and Flues, 50c.; Iron Axle Turnings, $1; Soft Steel Axle Turnings, $1; Machine Shop Turnings, 75c.; Cast Borings, 50c.; Mixed Borings, 50c.; No. 1 Mill, 50c.; Country Sheet, 50c.; No. 1 Dealers, 50c.; No. 1 Cast Scrap, 75c.; Stove Plate, 50c.; Railroad Malleable, $1; Agricultural Malleable, 50c.; making the selling prices by railroads and buying prices by large consumers in car lots at Chicago range about as follows, per gross ton:

Old Iron Rails	$17.50 to $18.00
Old Steel Rails, 4 feet and over	13.00 to 13.50
Old Steel Rails, less than 4 feet	11.50 to 11.75
Heavy Relaying Rails, subject to inspection	20.50 to 21.50
Heavy Relaying Rails, for side tracks	19.00 to 20.00
Old Car Wheels	13.00 to 13.50
Heavy Melting Steel Scrap	11.50 to 11.75
Mixed Steel	9.50 to 10.00

The following quotations are per net ton:

Iron Fish Plates	$14.50 to $15.00
Iron Car Axles	18.50 to 19.00
Steel Car Axles	15.50 to 16.00
No. 1 Railroad Wrought	13.50 to 14.00
No. 2 Railroad Wrought	12.50 to 13.00
Shafting	13.00 to 14.00
No. 1 Dealers' Forge	10.00 to 11.00
Wrought Pipes and Flues	9.50 to 10.00
Iron Axle Turnings	8.25 to 8.75
Soft Steel Axle Turnings	8.25 to 8.75
Machine Shop Turnings	7.75 to 8.00
Cast Borings	5.50 to 5.75
Mixed Borings, &c.	5.50 to 5.75
No. 1 Mill	7.50 to 8.00
Country Sheet	5.50 to 6.00
No. 1 Boilers, cut to Sheets and Rings	9.00 to 9.50
No. 1 Cast Scrap	11.75 to 12.25
Stove Plate and Light Cast Scrap	9.50 to 10.00
Railroad Malleable	10.75 to 11.00
Agricultural Malleable	9.75 to 10.00

Metals.—The market is strong for all Metals and advances have been made in Spelter and Copper. Spelter is ¼c. higher and is now quoted at 5⅜c. to 5½c. for car lots and 5⅝c. to 5¾c. in smaller lots. Casting Copper is also ¼c. higher and is held at 13¼c. to 13½c., with Lake unchanged at 13½c. to 13¾c. Pig Tin is still quoted at 29¾c. to 30c., while Pig Lead is unchanged at 4.20c. for 50-ton lots, 4.30c. for car lots and 4.50c. for small lots. Sheet Zinc is stationary at 6¼c. for car lots of 600-lb. casks and 6⅝c. for smaller lots. Prices on Old Metals have advanced throughout almost the entire list, prices being as follows: Copper Wire and Heavy, 12¼c. to 12½c.; Copper Bottoms, 11c. to 11¼c.; Copper Clips, 11¾c. to 12c.; Red Brass, 11c. to 11¼c.; Red Brass Borings, 9c. to 9¼c.; Yellow Brass, Heavy, 8¼c. to 8½c.; Yellow Brass Borings, 7¼c. to 7½c.; Light Brass, 6¼c. to 6½c.; Lead Pipe, 4.15c.; Tea Lead, 3¾c.; Zinc, 4¼c.; Pewter, No. 1, 18½c.; Block Tin Pipe, 25c.

Coke.—Under the stimulus of a suddenly active Iron market Coke also is somewhat stronger in tone, $2 at ovens being about the ruling price for Connellsville 72-hour Foundry Coke, which means $4.65, Chicago, in car lots.; 10c. higher or lower than these figures is paid for Cokes that are more or less favored. There is still obtainable some Coke from ovens along the L. & N. road that enjoy the $2.25 freight rate, making prices in Chicago $4.15 to $4.25, but these ovens are rapidly withdrawing from the Western market owing to the demand in the Birmingham district, which they can supply at higher prices than are bid in this market, the shipments westward being limited to the strictly Foundry grade, and even that is being largely diverted to nearer markets.

The De Camp Brothers & Yule Iron, Coal & Coke Company, St. Louis, has established a branch sales office at 1105 Fisher Building, Chicago, in charge of A. B. Stevenson, for the sale of Pig Iron, Coke and Coal. C. A. Stevenson & Co., for whom A. B. Stevenson was Chicago representative, have withdrawn from that market.

Philadelphia.

FORREST BUILDING, October 25, 1904.

The Iron and Steel trades as regards general conditions are precisely the same as they were a week ago. Prices of Pig Iron are a little dearer, and the demand in most lines shows considerable improvement, although there is probably more speculative buying than is entirely wholesome. Still, the change is very welcome, inasmuch as business can be had, and prospects are favorable for continued improvement. The question of prices, however, is a difficult one, and if not carefully watched may lead to trouble. The advance in Pig Iron as far as it has gone, is entirely legitimate, and the recent large purchases will doubtless prove advantageous to the buyers, but there is no change in general conditions to warrant further advances until it is seen how far the improved conditions will affect consumption. The purchases of Pig Iron during the past two or three weeks are equivalent to two or three months' consumption, and to discount two or three months beyond that is liable to be carrying optimism to extremes. The capacity for production is very large, and it would not be much of a strain to make an increase of 10,000 to 15,000 tons per week, which would meet larger requirements than appear to be probable at the present time. There is an undoubted scarcity of Ores and Coke, and these may be handled so as to keep Pig Iron up to the highest figures possible, but apart from that Southern furnaces are liable to start up just as soon as enough Pig Iron can be sold at prices to suit, but what these may be will depend upon their estimate of what the market will stand. Ultimately prices will be governed by the demand, but it is quite impossible to say what tonnage will be required to meet it. As far as regards this vicinity, the consumption has not increased very greatly, but if reports from the West and other districts are confirmed, there may be more Iron wanted than has been figured on. For the present, however, prices are believed to be high enough, although it is evident that the disposition among buyers is to increase their orders for raw material to the fullest limit possible.

Pig Iron.—The feeling in regard to Pig Iron is feverish and unsettled, and under the circumstances it could hardly be otherwise. Large buyers have been following the advance and have taken a heavy tonnage at a good deal higher prices than would have been thought possible a week ago. This leads to all sorts of inquiries—what are they buying for, why are prices advancing, and if they are going higher, and how much higher? These are difficult questions to answer, and impossible to answer with a certainty. It is not unlikely that the inception of the present movement was in the optimistic views which appear to have affected everybody, and perhaps in no inconsiderable degree to intrinsically better conditions. The difficulty in a case of this kind is to know how far speculative influences will carry prices, and just as difficult to determine how much is real and how much is artificial. At the moment prices of Pig Iron are very moderate, but they are nearly—if not quite—$1 higher than they were a month ago, and speculative buying might carry them to still higher figures, which would surely lead to an immediate increase in production. It is claimed that Coke and Ores will be maintained at figures which will force higher prices for Pig Iron, but whether that can be done or not will depend a good deal on the character and the extent of the demand. Under these circumstances it would seem that conservative methods would be to move slowly at the advanced prices. Large buyers are not likely to be in the market again during 1904, so that the demand during the remainder of the year will be less important than it has been during the past two or three weeks, unless the speculative fever runs away with good judgment. In

times like these, however, there is no saying what will happen if the notion takes possession of people that a boom in Iron is coming. The basis for such opinions does not appear to have much foundation, but it is believed it will perhaps be acted upon, foundation or no foundation. In the meanwhile the movement in material for Steel making has been very heavy, Basic Pig having been taken in large lots at prices varying from $13.50 to $14, delivered. Foundry Irons have not been as heavily dealt in, although prices are 50c. better than they were last week; but the feeling is unsettled, some asking still higher prices, while others are taking business freely without being urgent for extreme figures. A fair average of to-day's prices would be about as follows for city and nearby deliveries, although the market is in such condition that it might easily change 25c. before the end of the week:

No. 1 X Foundry	$15.50 to $15.75
No. 2 X Foundry	14.75 to 15.00
No. 2 Plain	14.25 to 14.50
Standard Gray Forge	13.75 to 14.00
Ordinary Gray Forge	13.25 to 13.50
Basic	13.75 to 14.00
Low Phosphorus	18.50 to 19.00
Malleable Iron	14.75 to 15.00

Steel.—The demand is very much stronger and mills now find it somewhat difficult to meet all requirements promptly. Prices are firm at $22, but it would be difficult to place large orders, as the mills have about all the business they can handle during the remainder of the year.

Plates.—The demand is improving, but as yet it has attained no such proportions as that for raw materials. There is a gradual increase in the demand for small lots, however, with a fair proportion of large orders; so that the tendency is distinctly toward improvement. More inquiries are also noticeable, and on the whole the prospects are quite favorable for the remainder of the year. Prices are as follows:

	Carload. Cents.	Part carload. Cents.
Tank, Bridge and Boat Steel, rectangular Plates, 24 inches wide and under	1.43½	1.48½
Tank, Bridge and Boat Steel, over 24 inches wide	1.53½	1.58½
Flange or Boiler Steel	1.63½	1.68½
Marine, A. B. M. A. and Commercial Fire Box Steel	1.73½	1.78½
Still Bottom Steel	1.83½	1.88½
Locomotive Fire Box Steel	2.03½	2.08½

The above are base prices for ¼-inch and heavier. The following extras apply:

3-16 inch thick	$0.10 per lb. extra.
Nos. 7 and 8 W. G.	.15 "
No. 9 W. G.	.25 "
Plates over 100 to 110 inches	.05 "
Plates over 110 to 115 inches	.10 "
Plates over 115 to 120 inches	.15 "
Plates over 120 to 125 inches	.25 "
Plates over 125 to 130 inches	.50 "
Plates over 130 inches	1.00 "
All sketches (excepting straight taper plates, varying not more than 4 inches in width at ends, narrowest end being not less than 30 inches)	.10 "
Complete Circles	.20 "

All the above f.o.b. Philadelphia.

Structural Material.—There is a steady improvement along the entire line, and while nothing important has been done locally, yet the feeling is decidedly hopeful and prospects much better than seemed probable a few weeks ago. Prices unchanged, as follows—viz.: Beams, Channels and Angles, 1.53½c. to 1.65c., according to specifications, and small Angles, 1.50c. to 1.55c.

Bars.—The demand for Bars is decidedly better and some of the mills have all the business they want at current quotations. The improvement is of a general character, consumers having become active buyers, while at the same time merchants are disposed to stock up for the winter months. The result has been that those making first-class Iron have nearly all the orders they can fill during the remainder of the year. Outside mills are getting a good share of business, too, and are not disposed to shade prices, which are as follows: For either Iron or Steel Bars, in carload lots, 1.43½c.; part carloads at the usual advance.

Sheets.—There is a heavy demand for Sheets and mills have taken a large amount of business at advanced prices. Inquiries are still coming in for large lots, but it will be difficult to place orders for forward delivery, even at the higher prices recently established.

Old Material.—The market has developed further strength, and some articles command considerably more money than could have been realized a week ago. Steel Scrap is held at $14.50 (some sales as high as $14), but the market is not easily quotable, as material is scarce and needy buyers must pay the price. Exact figures cannot be given on a market of this kind, but the range for deliveries in buyers' yards is about as follows:

No. 1 Steel Scrap	$14.00 to $14.50
Old Steel Axles	17.00 to 17.50
Old Iron Axles	19.75 to 20.50
Old Iron Rails	17.00 to 17.50
Old Car Wheels	13.00 to 13.50
Choice Scrap, R. R. No. 1 Wrought	16.00 to 16.50
Machinery Scrap	13.00 to 13.50
Low Phosphorus Scrap	16.75 to 17.00
Wrought Iron Pipe	12.25 to 12.75
No. 1 Forge Fire Scrap	11.00 to 11.50
No. 2 Forge Fire Scrap, Ordinary	9.00 to 9.50
Wrought Turnings	9.00 to 9.50
Wrought Turnings, Choice Heavy	10.00 to 10.50
Cast Borings	7.25 to 7.50
Steve Plates	10.00 to 10.50

Cincinnati.

FIFTH AND MAIN STS., October 26, 1904.—(*By Telegraph.*)

Pig Iron.—The market during the past week has shown added strength with prices stiff at an advanced figure and practically 75c. per ton for Southern grades. From the number of inquiries developing and the numerous sales made it would seem that the rank and file are getting in and that the buying is not being done by the larger consumers. There have been a liberal sprinkling of sales extending not only over the balance of this year, but into the next for a period of six months. Several of the large producers of the South are practically out of the market, and are refusing to quote for any delivery. These furnaces are piling their output, and the result is scarcity among the consumers in their own immediate territory as well as in the North. The stock in the Birmingham district is gradually becoming less effective, and the report is that a number of new States will be blown into within the next few weeks. It seems to be a conceded fact that in order to maintain the strength of the market as it now stands it would be far better if there was more of a tendency to revise the price of the Northern product, thereby putting it on a more equal basis with Southern. While it is true that Northern Iron has shown an advance of about $1 over last week's quotations, this movement has not been rapid enough to keep pace with its Southern rival. The apparent strength of the movement is shown in the fact that there has been no considerable tonnage disposed of in round lots, but the bulk of the transactions have been centered on a great number of what would be termed small sales. The largest inquiry of which we have any knowledge comes from a Central Ohio concern, and is for about 3200 tons on an analysis basis equivalent to Nos. 2 and 3, delivery covering the first half of next year. The condition of the foundries of the city is daily growing better, and consumption of Foundry grades is slowly on the increase. The Cast Iron Pipe interests are said to be in the market for almost unlimited tonnage, and they are buying large quantities of available Iron. Freight rates from Hanging Rock district to Cincinnati, $1.15, and from Birmingham, $2.75. We quote, f.o.b. Cincinnati, as follows:

Southern Coke, No. 1	$14.25 to $14.75
Southern Coke, No. 2	13.75 to 14.25
Southern Coke, No. 3	13.25 to 13.75
Southern Coke, No. 4	13.00 to 13.25
Southern Coke, No. 1 Soft	14.25 to 14.75
Southern Coke, No. 2 Soft	13.75 to 14.25
Southern Coke, Gray Forge	12.75 to 13.00
Southern Coke, Mottled	12.50 to 12.75
Ohio Silvery, No. 1	16.65 to 17.15
Lake Superior Coke, No. 1	.... to 14.65
Lake Superior Coke, No. 2	.... to 14.15
Lake Superior Coke, No. 3	.... to 13.65

Car Wheel and Malleable Irons.

Standard Southern Car Wheel	$16.25 to $16.75
Lake Superior Car Wheel and Malleable	15.80 to 16.30

Coke.—This market is gradually showing additional strength, probably in sympathy with the increased activity in Pig Iron. Producers are holding for higher prices for next year's deliveries, and the general feeling is one of buoyancy. We quote the best grades of Connellsville Coke from $2 to $2.25, f.o.b. ovens.

Plates and Bars.—Finished Material is in better demand and agents report trade as gradually on the increase. The Bar market is especially active, a noticeable feature being in the increased size of orders. We quote, f.o.b. Cincinnati, as follows: Iron Bars, in carload lots, 1.50c., with half extras; the same in smaller lots, 1.70c., with full extras; Steel Bars, in carload lots, 1.43c., with half extras; the same in smaller lots, 1.65c., with full extras; Base Angles, 1.53c., in carload lots; Beams and Channels, in carload lots, 1.53c.; Plates, ¼-inch and heavier, 1.53c., in carload lots; in small lots, 1.80c.; Sheets, 16-gauge, in carload lots, 2.05c.; smaller lots, 2.60c.; 14-gauge, in carload lots, 1.95c.; in smaller lots, 2.50c.; Steel Tire, ¾ x 3-16 and heavier, 1.63c., in carload lots.

Old Material.—A more satisfactory condition exists among dealers than has been shown for some time. Quite a large amount of business is being done in a small way, the aggregate, however, amounting to a considerable tonnage. Prices as far as can be ascertained are unchanged. We quote dealers' prices, f.o.b. Cincinnati, as follows: No. 1 Railroad Wrought Scrap, $10.50 to $11.50 per net ton; No. 1 Cast Scrap, $10 to $10.50 per net ton; Iron Rails, $14 to $14.50 per gross ton; Steel Rails, rolling lengths, $10 to $11 per gross ton; Relaying Rails, $18 to $19 per

gross ton; Iron Axles, $14 to $15 per net ton; Car Wheels, $10 to $10.50 per gross ton; Heavy Melting Scrap, $9.50 to $10.50 per gross ton; Low Phosphorus Scrap, $11.50 to $12 per gross ton.

Pittsburgh.

PARK BUILDING, October 26, 1904.—(*By Telegraph.*)

Pig Iron.—The Lackawanna Steel Company has bought about 15,000 tons of standard Bessemer Pig Iron for November and December shipment. It is understood the Iron was bought from the Bessemer Pig Iron Association, but this is not officially confirmed. It is understood that the same company will buy 10,000 to 15,000 tons more, on which it has options for a week or ten days. A leading local Steel interest came in the market about a week ago with inquiries for about 20,000 tons of Bessemer Iron, and up to this time has closed for about 12,000 tons on the basis of about $12.50, at Valley furnace. It was able to buy at $12.50, at furnace, owing to the fact that it got options on the Iron about a week ago, before Iron had advanced to where it is now. The same buyer still has options on 10,000 to 15,000 tons of standard Bessemer, and will likely buy more before this week is out. These large sales, together with others, have pretty well cleaned up the available Bessemer Iron for shipment this year, and the market is very strong at $12.75 to $13, Valley furnace. It is doubtful if any considerable tonnage of Bessemer Iron could be bought to-day at less than $13, at furnace. For first three months of next year Bessemer and Basic are held at $13, Valley furnace, and we note a sale of 1000 tons at this price and for first quarter delivery. There is a good deal of inquiry for Foundry Iron, and four or five of the leading furnaces that run on Foundry have advanced their price to $13.50, at Valley furnace, or $14.35, Pittsburgh, and absolutely refuse to sell lower. Several sales of Northern No. 2 for November and December shipment are reported at this price. The fact that Southern makers of Foundry Iron have been able to sell No. 2 Foundry at $11, and up to $12, Birmingham, has had the effect of materially advancing the Northern market. There is a good deal of inquiry for Forge Iron, and a scarcity in supply. Northern brands are held at $12.85 to $13, Pittsburgh, but it is doubtful if any considerable tonnage could be bought below $13, Pittsburgh, while some sellers quote this price at Valley furnace.

Billets.—The Steel market is quite strong. The Billet Association has advanced prices on Forging Billets $2 a ton, and these are now held at $21.50, f.o.b. Pittsburgh, to which actual freight to destination is added. We quote Bessemer and Open Hearth Billets at $19.50; Long Sheet and Tin Bars, $21.50, f.o.b. Pittsburgh, plus actual freight to point of delivery.

Structural Steel.—The Jones & Laughlin Steel Company will furnish 4000 tons of Structural Steel for the new Wabash freight depot in this city.

Steel Cars.—The Standard Steel Car Company, Pittsburgh, with works at Butler, Pa., has secured a contract for 200 Steel flat cars for use on the Panama Canal. The same company has received an order for 1500 refrigerator cars from the German American Car Company and for 2100 Steel cars from the Erie Railroad.

(*By Mail.*)

Within the past week prices of Pig Iron have been soaring skyward and the market is experiencing a good sized boom. Prices are advancing rapidly and this week Standard Bessemer Pig has sold at prices ranging from $12.65 up to $13, at furnace, the majority of the tonnage sold being at $12.65 to $12.75, at Valley furnace. Last week the Lackawanna Steel Company came in the market for 40,000 tons of Standard Bessemer Pig Iron, the proposal being to trade Ore for Pig Iron. However, as it is so late in the season and it would be practically impossible to handle any large tonnage of Ore at this time, the proposition of the Lackawanna was not accepted by any of the furnace interests. It is therefore probable that the Lackawanna Company will buy about 25,000 tons of Standard Bessemer Iron for November and December shipment from the Bessemer Pig Iron Association and some of the outside furnaces. This deal is now under way and the price is likely to be $12.75, at Valley furnace. Should the Lackawanna Company buy this tonnage of Bessemer Iron it would no doubt have the effect of advancing prices still further, as the market is excited and the supply of Bessemer Iron is limited. We can also state that a large local Steel interest is in the market for 15,000 tons of Bessemer and Basic Iron, and will likely buy within a day or two. The Bessemer Pig Iron Association absolutely declines to sell Bessemer Iron under $12.75, at Valley furnace, for shipment this year, and has only a limited tonnage to sell at that price. The association has not yet fixed a price on either Bessemer or Basic Iron for the first quarter delivery, believing that, in view of the somewhat excited condition of the Pig Iron market at present, it is better to hold off fixing the price for next year until things have settled down to some extent. A few small sales of Bessemer and Basic Iron for first quarter have been made by outside furnace interests at $13, at Valley furnace. Prices on Foundry Iron are very strong, Northern No. 2 being firmly held at $12.75 to $13, at furnace, while some sellers quote as high as $13.50, and it would be impossible to buy very much Iron below $13, at furnace. There is a good inquiry for Foundry Iron and it looks as though prices would be higher. We note a heavy inquiry for Forge Iron, Northern brands being held firmly to-day at $13 to $13.15, Pittsburgh.

In Finished Iron and Steel the situation seems to be slowly improving, doubtless due to the improved condition of the Pig Iron market. The recent advance of $2 a ton in Merchant Pipe is being firmly held and has not decreased demand to any noticeable extent. The Structural Steel market is showing betterment, some fairly large jobs having been placed in the past week.

Ferromanganese.—No large sales have been made in the past week, leading consumers having pretty well covered their requirements for some time to come. We quote foreign and domestic 80 per cent. Ferro at $41, delivered, for large lots.

Wire Rods.—The Rod market is fairly active and prices are firm. We quote Bessemer and Open Hearth Rods at $26 to $26.50 for Pittsburgh delivery.

Skelp.—The fact that the leading Skelp mills are pretty well filled up with tonnage, together with the heavy advance in price of Forge Iron, has had the effect of causing a stiff advance in prices of Skelp, which have gone up fully $1 a ton or more. We therefore advance our prices on Skelp and now quote as follows: Grooved Iron Skelp, 1.45c. to 1.50c.; Sheared Iron Skelp, 1.50c. to 1.55c.; Grooved Steel Skelp, 1.35c. to 1.40c., and Sheared, 1.40c. to 1.45c. All above prices are for ordinary widths and gauges, and are f.o.b. cars, maker's mill.

Steel Rails.—No important orders have been placed for Standard Sections, which are very quiet. The heavy demand for Light Rails has brought about higher prices, and they are held at $19.50, minimum, for the heavier sections, and up to $23 for the lighter sections.

Structural Material.—Some large local contracts have been placed in the past week. Among these is the Wabash freight depot in this city, which has been finally placed with the McClintic-Marshall Construction Company, and will require about 4000 tons. The same concern has secured contract for a distributing station at Niagara Falls, Ontario, Canada, for the Ontario Power Company, and also four steel buildings for the Youngstown Iron Sheet & Tube Company, at Youngstown, Ohio, involving considerable tonnage. The Louisville & Nashville Railroad has placed in the past week orders for about 2000 tons of bridge work, the business going to American Bridge Company. We understand that on some very large jobs recently placed the agreed prices for fabrication and erection have been shaded. Some good sized jobs are being figured on, and are expected to be placed within the next week or two. We quote: Beams and Channels, up to 15-inch, 1.40c.; over 15-inch, 1.50c.; Angles, 3 x 2 x ¼ inch thick up to 6 x 6 inches, 1.40c.; Angles, 8 x 8 and 7 x 3½ inches, 1.50c.; Zees, 3-inch and larger, 1.40c.; Tees, 3-inch and larger, 1.45c. Under the Steel Bar Card, Angles, Channels and Tees under 3-inch are 1.40c., base, for Bessemer, and 1.45c., base, for Open Hearth, subject to half extras on the Standard Steel Bar Card.

Plates.—As noted in previous reports, demand for Plates is showing considerable betterment, but the mills could handle a still larger tonnage than is being placed. The report that the Pittsburgh Steam Ship Company had placed an order for four Ore boats with a Cleveland concern has not been verified. If it is true it means a very heavy tonnage of Plates and small shapes will be required. We are advised that official prices are being firmly held, and we quote: Tank Plate, ¼ inch thick, 6¼ to 24 inches wide, 1.30c., base; over 24 inches wide and up to 100 inches in width, 1.40c., base, at mill, Pittsburgh. Extras over the above prices are as follows:

	Per pound extra.
Gauges lighter than ¼-inch to and including 3-16-inch Plates on thin edges	$0.10
Gauges No. 7 and No. 8	.15
Gauge No. 9	.25
Plates over 100 to 110 inches	.05
Plates over 110 to 115 inches	.10
Plates over 115 to 120 inches	.15
Plates over 120 to 125 inches	.25
Plates over 125 to 130 inches	.50
Plates over 130 inches	1.00
All sketches (excepting straight taper Plates, varying not more than 4 inches in width at ends, narrowest end being not less than 30 inches)	.10
Complete Circles	.20
Boiler and Flange Steel Plates	.10
Marine, "A. B. M. A." and ordinary Fire Box Steel Plates	.20
Still Bottom Steel	.30
Locomotive Fire Box Steel	.50

Shell grade of Steel is abandoned.

TERMS.—Net cash 30 days. For anticipated payments a maximum discount may be allowed at the rate of 6 per cent. per an-

num, and for a longer time than 30 days interest shall be charged at the same rate per annum. Invoices paid within ten days from date thereof, discount of ½ of 1 per cent. is allowable. Pacific Coast not included.

Sheets.—The condition of the Sheet trade is fairly satisfactory, demand being especially heavy for Electrical and Roofing Sheets. It is said, however, that prices on Electrical Sheets are very low when the high quality demanded by consumers is considered. Consumers of Sheets are not disposed to contract for delivery ahead, most of the orders being placed for prompt shipment. We quote No. 26 Black Sheets, box annealed, one pass through cold rolls, at 1.95c.; No. 27, 2c.; No. 28, 2.10c., in carloads and larger lots. Galvanized Sheets are sold at 80 and 7½ per cent. off. We quote net prices of Galvanized Sheets as follows: Nos. 22 and 24, 2.59c.; Nos. 25 and 26, 2.77c.; No. 27, 2.96c., and No. 28, 3.15c. Jobbers charge the usual advance over these prices on small lots from store.

Iron and Steel Bars.—There is an increasing demand for both Iron and Steel Bars, partly due to the recent good sized orders for Steel cars that have been placed. The leading mills report that tonnage is increasing, while specifications on contracts are coming in better than for some time. We quote Bessemer Steel Bars at 1.30c., base; Open Hearth Bars at 1.35c., base, with the usual differentials for small lots. We quote Refined Iron Bars at 1.30c., f.o.b. Pittsburgh.

Railroad Spikes.—There is a moderate demand at unchanged prices. We quote Railroad Spikes at $1.55 in carloads and $1.60 in less than carloads per 100 lbs., f.o.b. Pittsburgh.

Hoops and Bands.—Demand is moderate, but there is no change in prices. We quote Steel Bands at 1.30c., extras as per Steel card, and Steel Hoops at 1.55c., in carload lots, f.o.b. Pittsburgh.

Tin Plate.—As noted last week, heavy inquiries from the canning interests are in the market for delivery through the first half of next year. Consumers, however, decline to place contracts unless at guaranteed prices, and with the upward movement in Pig Iron, together with a possible advance in price of Tin Bars, the Tin Plate mills are not disposed to guarantee prices against decline so far ahead. While some business has been placed for next year at present prices, the amount is relatively small. We quote 100-lb. Cokes at $3.25 net, f.o.b. Pittsburgh, terms 30 days, or 2 per cent. off for cash in 10 days.

Merchant Pipe.—The advance of $2 a ton in Merchant Pipe made on October 19 by the National Tube Company, and also by the outside mills, was a surprise to the trade, as it was not anticipated. We are advised that demand for Merchant sizes of Pipe is active and the mills are reasonably well filled up for the next several months. Nothing has been done on the Ontario gas line and it will hardly be placed this year. Discounts to consumers are as follows:

Merchant Pipe.

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
	Per cent.	Per cent.	Per cent.	Per cent.
⅛ and ¼ inch	70	54	68	52
⅜ and ½ inch	74	62	72	60
¾ to 6 inches	78	68	76½	66½
7 to 12 inches	73	58	71½	56
Extra strong, plain ends.				
⅛ to ⅜ inch	63	51	61	49
½ to 4 inches	70	58	68	56
4½ to 8 inches	66	54	64	52
Double extra strong, plain ends, ⅛ to 8 inches	59	48	57	46

Merchant Steel.—Tonnage being received by the mills is larger than for some time, while specifications on contracts are coming in at a satisfactory rate. Prices are firm, with the exception of Shafting, which is occasionally slightly shaded for desirable orders. We quote: Tire Steel, 1.50c.; Sleigh Shoe, flat, 1.40c.; Cutter Shoes, tapered and bent, 1.90c. to 2c.; Open Hearth Spring Steel, 1.85c. to 2c., depending on order. Crucible Tool Steel ranges from 5½c. to 7c. for ordinary grades and 8c. to 15c. for best grades. Cold Rolled Shafting is firmer at 52 per cent. off in carloads and 47 per cent. in less than carloads, delivered in base territory.

Spelter.—The market is firmer since last week, and prices have advanced. We now quote Prime Grades of Western Spelter at 5.07½c. to 5.10½c., Pittsburgh.

Connellsville Coke.—Demand for both Furnace and Foundry Coke continues active, and some important negotiations are on between furnace interests and Coke makers on contracts for Furnace Coke for first six months of next year. We understand that one or two such contracts have been closed on the basis of $1.60, at oven. The outlook is that prices on strictly Connellsville Coke for first half of next year will range from $1.60 to $1.75 a ton, at oven. Strictly Connellsville 72-hour Foundry Coke is firm at $2 to $2.25 a ton, at oven, to consumers. The Frick Coke Company is marketing a limited amount of Foundry Coke for which it obtains $2.50 a ton, at oven. A short water supply at some of the works in the region is interfering with output. In the Upper and Lower Connellsville regions last week the total output was about 255,000 tons, a decrease of nearly 20,000 tons over the previous week, almost wholly due to short supply of water.

Iron and Steel Scrap.—The market on Old Material is more active than for some time, and prices are firm and likely to be higher. Dealers who have stocks of Scrap on hand are disposed to hold off from selling, believing the market will improve. We quote: Heavy Melting Stock, $12.50; No. 1 Wrought Scrap, $12.75 to $13; Cast Iron Borings, $7 to $7.25; Bundled Sheet Scrap, $10.50 to $11; Iron Car Axles, $18.50 to $19; Old Rails, long pieces, $13.25 to $13.50; short pieces, $11.75 to $12; Wrought Turnings, $9.75 to $10, all in gross tons.

Cleveland.

CLEVELAND, OHIO, October 25, 1904.

Iron Ore.—The buying of Ore has about been stopped for this season. Since nothing is being done looking to the covering of needs into next year the Ore trade is quiet. The movement down the lakes is uneventful. The supply of boats is about equal to the demand. Rates of carriage remain about as they have been, with Duluth bringing 75c., Marquette 65c. and Escanaba 55c. The shipment away from the lake docks is increasing, in keeping with the possibilities of the railroads. The equipment is in a little better shape and for that reason the movement is somewhat more free. The furnaces are showing inclinations to take a great deal of material. Some of them are just about to resume operations, which, of course, increases the demand for the raw material.

Pig Iron.—There has been almost a revolution in the Pig Iron trade in this territory during the past week. Buyers of Foundry, who a week ago were not willing to take more than 200 to 300 tons of material, have come into the market asking for contracts covering 2000 to 4000 tons. The result has been that whereas the furnaces in this territory had been comfortably fixed up until the end of the year and easy as to business through the first quarter of next year, the buying has been such as to congest them for the ensuing six months. Many of the furnace companies located in Cleveland have withdrawn from the market for the time being and have jumped prices considerably. The optimistic atmosphere now being breathed also has as one of the buoys of its hope the fact that most of the foundrymen have not covered for a pound more than they actually need. The foundrymen generally are disposed to cover for only what need they have immediately in sight, being disposed to proceed with caution in their buying. This has had a reflexive effect upon the trade and the furnacemen are also getting cautious. Prices a week ago ranged $12.25 to $12.50 in the Valleys. Now the furnaces are holding for $13.50 in the Valleys for No. 2. Most of the Iron sold during the past week has gone at $12.50, with some of it sold at $12.75. There are reports of a little Iron that went as high as $13 in the Valleys for No. 2 Foundry. The prices which are now being asked are mostly on Iron to be delivered when the furnaces are in shape to make delivery. Since most of the furnaces asking this price have no Iron for immediate shipment and are not in position to offer anything soon, that price is largely nominal. It refers at present mostly to the business that has to be done at the conclusion of the existing contracts or for delivery during the second quarter of next year. There are some furnaces which normally produce Foundry which are soon to be returned to blast. These have been idle during the past six months. Many of these furnaces are entirely sold up for the remainder of this year. Others are sold up for the first quarter of next year. All of them are comfortably sold up for the first quarter of next year. Most of these furnaces, of course, will have some Iron for delivery from time to time, but the supply is not large. The shortage of Southern Iron for mixture, the short supply of Coke, preventing full operation of some furnaces, and the tremendous buying during the past week account for the present shortage of Foundry Pig Iron. There is also a good tone to the Basic market. The producers in this territory are now off the market for this year, having nothing more to sell at the old prices of $12.25 to $12.50. They are asking $13, but no sales have as yet been made. There has been some good business in Malleable, a good sized tonnage during the past week having been sold at $13 at the furnace for delivery during the remainder of the year. Material for delivery during the first and second quarters of next year shows slightly different prices. Coke prices have also stiffened. The ovens are refusing to quote on Furnace Coke for delivery after the first of the year, and some of them want increased prices now. The market is rather stiff, with the supply of material somewhat limited. Foundry Coke has advanced to $2.10 at the ovens.

Finished Iron and Steel.—The market has been rather peculiar. Bar Iron has been stronger as to price without gaining anything in the matter of volume. Sheets have been stronger, but competition fierce; Plates and Shapes have

been in better demand, and Billets are advancing, and yet Cleveland is set aside as the weakest Steel market in the country. The conditions, perhaps, warrant the assertion. The strength in Bars here has not grown out of the increased demand, but is an arbitrary advance of prices to meet the rise in the price of Scrap, which has been forced by the dealers. The mills are now getting about 1.35c., at the mills. The market has been steady but not strong. There has been a fair demand for Sheets. The trade has been better than during the past two weeks, and there is not so much talk of price cutting. And yet the market falls short of what might be expected, the situation in the other trades being understood. The ship trade has furnished most of the demand for Structural Shapes and Plates. That buying has been of a peculiar nature, the orders going to the mills which in turn are interested in boat property in such a way as to throw business toward the shipbuilding companies. This has limited the buying to a few mills, and has, therefore, not given the market any breadth. There has been very little buying in other lines. The building trade in Cleveland, and the users of plates are not quite so active as they have been. The market for Billets has grown very strong. Most of the smaller mills prove to have sold up most of their capacity when prices were being cut and now have very little material for sale. The larger mills are consuming a vast proportion of their own output and that strengthens that market. The result is that on Forging Billets especially the prices have risen. The mills are now asking $2 above the agreed price, or $23.90, Cleveland. There has been very little if any demand for Rails, but some projects now on foot make for a better market soon.

Old Material.—The market has stiffened all around and the outlook is ever so much improved. The local mills have been buying heavily and have been combating the constant tendency of prices to rise. Notwithstanding that fact the market has worked steadily higher and prices are up considerably. There is a little uncertainty about Iron Car Axle quotations, those having been nominal. We revise and quote—all gross tons: Old Steel Rails, $13; Old Car Wheels, $12.50; Heavy Melting Steel, $12.50. All net tons: Cast Borings, $5.50 to $6; No. 1 Busheling, $11.50 to $12; No. 1 Railroad Wrought, $13; Wrought Turnings, $8 to $8.50; Iron Car Axles, $17 to $18; No. 1 Cast, $11 to $11.50; Stove Plate, $9.

Birmingham.

BIRMINGHAM, ALA., October 23, 1904.

There has been a change for the better in the Iron market and a further advance has been established, but the sales are not large. The truth is the Iron available for shipment the balance of the year is not sufficient to meet an active demand and orders are being scaled down every day. Not only that is happening, but orders are being declined constantly because of inability to furnish the Iron wanted.

Prices have climbed until No. 2 Foundry is currently quoted at $12, with sales at that figure and sales of No. 2 Soft at the same price. No. 2 Foundry has sold at a price as low as $11, but in limited volume and only to regular customers of long standing. No. 3 Foundry has sold at $10.50 in a limited way simply because there were not sellers to meet the demand for it. Your correspondent has seen sales registered at this price and has seen answers to orders at this price declined. Those who can usually be counted upon to meet the varying conditions of the market have withdrawn and are declining to name any price for any grade. The amount of business transacted is limited, not because there is no demand, but because there are not sellers to meet it. For the balance of this year the output is so well sold up that we will commence the new year with well cleaned up furnace yards. For delivery next year the sales are very slim. Sellers are not inclined to pile up deliveries at prices based on current values. Some No. 4 Foundry sold at $10 and some No. 1 Foundry sold at $12.50, but there were no round lots of any grade sold. The majority of the sales were in lots of 500 tons and less. Early in the week there was one sale of 5000 tons for delivery the first half of next year reported at $12 for No. 2 Foundry. No other sale approached this amount.

The strike is now regarded in some quarters as a thing of the past. It is not aggressive now and seems to be dying out. The operators report that they are gaining ground every day. You hear very little about it now. Affairs have improved very much in the past few weeks and they are fast reaching their normal condition.

(*By Telegraph.*)

BIRMINGHAM, ALA., October 25, 1904.—One sale of 350 tons No. 2 Foundry reported at $12.50; number of sales reported at $12. No. 3 Foundry quoted $11, some ask $11.50. One lot of 1000 tons held by outsiders offering at $10.50, net, equal to $10.75 regular. Fair orders and strong market.

Cincinnati Machinery Market.

CINCINNATI, OHIO, October 22, 1904.

The situation in machine tool circles to-day is far better and the outlook is much brighter than at any time during the past 12 months. Trade, both foreign and domestic, is on the ascendancy, and the movement promises to be a true general revival. Foreign trade, particularly with Japan, has been beyond expectations during the past two months, and reports are current that this movement has merely commenced. We are advised that they are at the present time in the market for any number of tools, principally lathes not exceeding 1000. At the time when the first inquiry was made the machine tool manufacturers of this city were in a position to meet all the requirements, and consequently received a nice share of this trade. Since that time they have held themselves in readiness to meet any future demands, and as a result are being awarded large contracts. Calls from domestic sources are more active, and the general impression prevails that better times are in store. The month of September probably was the largest in the actual booking of orders since the commencement of the depression, and from all reports October will be fully as great. Most of the machine shops have been put to great inconvenience and serious delays on account of the inability to receive castings, as a result of the molders' strike; in fact, a large amount of this business had to be sent to points outside of the city during the continuance of the trouble. While there is still some inconvenience being experienced along this line, matters are gradually quieting down and assuming normal conditions. During the summer months there were a great many rumors afloat that prices were being cut in cases where it was necessary to put certain machines on the market. We apprehend, however, that this has now been done away with, and, so far as we are able to ascertain, stability in this respect is assured.

The next meeting of the National Machine Tool Builders' Association will be held in the City of New York on November 15 and 16. This, according to President Lodge, is as the matter stands at present, although a slight change in dates may be decided upon later.

The new shop being erected by the Bullock Electric Company, known as shop No. 2, is rapidly nearing completion and is about ready for the roof. Part of the tools required for the installation of this building, mention of which was made in these columns some two months' since, have arrived and will be placed in position as soon as practicable. Among these we note one large blanking press from the Toledo Machine Tool Company, a 5-ton electric crane from the Case Mfg. Company, and one large annealing oven from Rockville Engineering Company. As was stated when this list was published, the inquiry covered only about one-half of the equipment that would eventually be required to complete the list. We are advised that the specifications for the balance of the machinery are not yet ready for publication, but will be in shape within the next few weeks. Business is largely on the increase and the company is now advertising for additional help, anticipating to have a force of 1250 men at work with the completion of shop No. 2. It is greatly increasing its patterns and has found it necessary to erect four tents to take care of these patterns. Plans and specifications are being made for a four-story brick building that will be 55 feet wide by 410 feet long for the manufacture and storage of patterns exclusively.

The new plant of the Oesterlein Machine Company is gradually assuming shape, outside walls on part of the building reaching as far as the second floor. Considerable delay is experienced on account of not receiving the necessary timbers, and this is causing some anxiety, as the lease of present quarters expires on January 1. The company sees some signs of improvement in trade and is anxious to occupy its new plant in season to utilize the increased facilities to handle the growing trade. The management will not be in a position to fully state as to what new equipment they will require in the installation of this plant until they have placed what machines they now are using, and ascertain what their requirements are.

Smith & Mills are doing a fair business, and say that their sales during the entire year have been very satisfactory. Within the past three months they have shipped 20 shapers to Japanese points, whether for Government use or not they are not able to say, as the shipment was made through agents.

The R. K. Le Blond Machine Tool Company says it is running full force and working until 8 o'clock p.m. Foreign trade has developed a great deal more strength, and the demands for home consumption are better than at any time during the past year. Sales during September were the

largest in 18 months. This is really the first good month the company has had since May, 1903.

The Cincinnati Milling Machine Company has just forwarded 16 milling machines to South Bethlehem, Pa., for the Bethlehem Steel Company. Quite an improvement is noted in domestic trade, especially from the East.

The Cincinnati Machine Tool Company is installing a new heating apparatus in its plant. This will have a 6-foot fan blower made by the American Blower Company. Everything is now running in good shape and the company is well pleased with the increased facilities for handling its output.

The American Tool Works Company feels that trade is developing along lines of interest. Foreign inquiry is better than for a long time, and, in addition to other foreign shipments made, it is sending one lathe, one planer, one milling machine and one shaper to South America points.

The Lodge & Shipley Machine Tool Company is in line with the rest of the machine tool builders in this city. From reports received it does not seem that any particular part of the country is responsible for the increased activity, but that general demand is on the increase, which is an indication of better times. The shops are running full time and with quite an increased force.

The New York Machinery Market.

NEW YORK, October 26, 1904.

In the machinery trade the past week there has been practically a repetition of the conditions ruling the two previous weeks, the sales with few exceptions being mostly of small amounts. There were, however, two or three transactions made around the $10,000 mark and one for $100,000 was reported. The Japanese Government, which has been a large buyer of late, was reported to have made considerable purchases, but on account of the secrecy maintained there is no way of getting at the aggregate amount. As far as inquiries are concerned the volume continues good, but they likewise are only for small or medium sized lots of tools. One good feature prevalent in the trade is the promise of a speedy renewal of activity among the railroads, the officials of which in their conversation with the leading merchants have given the impression that they will enter the market shortly and place some good sized orders. Not one but several of the large houses hold to this opinion, and there is good foundation for predicting a marked improvement within the next few weeks in the business of those catering to the wants of the railroad companies.

One of the chief topics talked about is the British Iron and Steel Institute, which is holding its meetings this week in New York, the proceedings of which are noted in another column of this issue. As the members are to inspect several of the important industries hereabouts and in other sections of the country, the iron and steel men of Europe will become better acquainted with certain classes of American machinery, which, it is hoped, will lead to some good import orders being placed here.

The projected improvements to the Bethlehem Steel Works, at South Bethlehem, Pa., are becoming more interesting to the machinery trade day by day as the plans of the owners are gradually unfolded and more light is shed upon the extent to which the plant is to be enlarged. When Charles M. Schwab acquired the works from the United States Shipbuilding Company it was stated that he would make it the greatest armor making and gun factory in the world, and from what has leaked out it looks very much as if the report will be found to have been correct in a very great measure. The plans for the extension are well under way, and while they are not sufficiently matured to admit of the detals being made public, we are informed that they contemplate the construction of some very large buildings, the feature of which, it is said, will be a machine shop about 600 feet long, to be equipped with the most modern machinery for making rapid fire guns and field artillery, as well as for commercial work. As Mr. Schwab's plans are being rapidly carried out, the company is bound to become one of the important consumers of machinery. Since the beginning of the Russo-Japanese war there has been a large demand for implements of warfare, and it is believed that for a long period after the cessation of hostilities they will be in active demand.

As a good source of revenue to builders of nearly all classes of machinery, power plant equipment, makers of iron and steel castings and endless other kinds of material there has been nothing equal to the tunnel and Subway work that has been going on in the New York district for the past few years. The Subway is practically finished, and is to be put in operation to-day; the New York & Jersey Tunnel Company's tube under the North River is about completed, and the work of constructing the East and North River tubes of the Pennsylvania tunnel system is well under way. From this latter hardly a week goes by but some important contracts for mechanical equipment are placed, and very shortly bids will be invited by the Pennsylvania Railroad for the construction of the land sections, including that from Seventh avenue east to the river, and the one through Bergen Hill, N. J., connecting the North River tube with the Hackensack Meadows, where the road is to come up into the open. The Bergen Hill tunnel will be over 6000 feet long. Although these land sections will be built of masonry, quantities of machinery will be required to build them, thus insuring a steady demand.

The machinery houses will have hardly finished supplying the needs of the contractors for the tunnels now under way when they will be called upon to put in bids for the necessary machinery for constructing another tunnel under the North River by the Delaware, Lackawanna & Western Railroad, if the plans of that company go through. The report published in these columns some months ago to the effect that the Lackawanna road intended to tunnel under the North River, and thus secure a terminal in New York, was confirmed this week by the incorporation of the Lackawanna Tunnel Railroad Company, with a capital stock of $300,000. It is officially announced by Walter W. Ross, attorney for the railroad company, that the move was decided upon at the last meeting of the Board of Directors, but beyond the merest outline no plans have been formulated. It has been decided, however, that the New Jersey terminus will be in Hoboken, and the New York terminus below West Twenty-third street. It is probable that the plans of the Pennsylvania tunnels will be followed to a great extent, and that no time will be wasted in getting operations started. The directors of the new company are all connected with the Lackawanna road, and include W. H. Truesdale, president of the railroad company; E. E. Loomis, vice-president; O. C. Post, general auditor; Thomas W. Lee, general passenger agent; Geo. F. Wilson, purchasing agent; A. D. Chambers, assistant treasurer; F. F. Chambers, secretary and treasurer; W. S. McGuire and Walter W. Ross, attorneys.

In connection with the above it will be of interest to note that the Intercity Link Railroad Company was incorporated a little less than a month ago with a capital stock of $125,000, to construct a tunnel under the Delaware River, connecting Philadelphia and Camden, N. J. Among the incorporators is Clarence Wolf of Wolf Bros. & Co., bankers and brokers, 608-610 Chestnut street, Philadelphia.

The Niles-Bement-Pond Company has just secured an order from the Erie Railroad Company for a miscellaneous lot of tools amounting to $100,000, which are to be distributed among the various shops of the railroad company along its line. This closes up the list which the Erie issued last August for $145,000 worth of tools, against which the smaller purchases were made some time ago. In addition to this the Niles-Bement-Pond Company has received its share of small and medium orders, many of which were placed with the Bement-Miles works at Philadelphia. This plant so far in October has secured orders aggregating $150,000, which is about the monthly capacity of the works. Practically none of the orders was of large proportions.

Some little machinery is likely to be required by the Coal & Coke Railroad, which intends to erect new shops at Gasaway half way between Elkins and Charlestown, W. Va. The matter is in the hands of W. H. Bowen, general manager, with offices at Elkins.

Work on the improvements to the freight yards of the Baltimore & Ohio Railroad at Grafton, W. Va., is going forward, and some of the contracts for the construction of the buildings have been let, while Roydhouse Arey & Co., Philadelphia, are receiving subestimates for a machine shop, engine and boiler houses and other structures. The contract for the erection of a 10-stall roundhouse at that point has been let to a Cincinnati contractor at a figure close to $10,000.

The Pennsylvania Steel Company, Steelton, Pa., has placed orders for the equipment for the extension to the bridge department. The cranes, which range in capacity from 2 to 60 tons, of which there are 19, will be furnished by the Alliance Machine Company, Alliance, Ohio, and the Niles-Bement-Pond Company, New York, who also secured the order for the special chord boring machines. The additional punches were purchased from the Hilles & Jones Company, Wilmington, Del.

Considerable new machinery will be required a little later on by the Lebanon Chain Works, Lebanon, Pa., which has secured a piece of property upon which will be erected an additional building, 100 x 200 feet. The company expects to place in this building, besides machinery for manufacturing chain, a large steam hammer and a pair of shears that will cut iron up to 4 inches. The plant is now equipped to make 3 3-16-inch diameter chain, but the company is not satisfied, and it desires to add machinery to make chain up to 4 inches.

A boring mill, milling machine, upright drill, hand punches and other machinery are required by the Butts-Nash Company, Oxford, N. Y., for equipping the addition to its plant which is now being built. The new building will be 20 x 76 feet, two stories in hight. The company manufactures engines, boilers and machinery.

Metal Market.

NEW YORK, October 26, 1904.

Pig Tin.—The Tin market during the week developed some weakness, owing to reports of heavy shipments from the Straits, but a reaction toward firmness occurred to-day. Business has continued to be quiet, the demand from consumers being still of a hand to mouth order. Most of the trading that was done was of a speculative character. At this writing prices quoted here are as follows: Spot and October, 28.70c. to 29c.; November, 28.62½c. to 28.87½c. The closing London prices to-day were: Spot, £131 10s.; futures, £130 10s., being a decline of 10 shillings in the spot price. The arrivals so far this month amount to 2705 tons, while about 985 tons are afloat.

Copper.—The export demand for Copper has continued in very heavy volume and has caused a further stiffening of the market here, prices ruling about ⅛c. higher than a week ago. The domestic trade is still rather backward, although some increase was noted from this source this week. The market closed strong with the following prices quoted: Lake, 13.37½c. to 13.50c.; Electrolytic, 13.12½c. to 13.37½c.; Casting, 13c. to 13.12½c. London cabled £60 17s. 6d. for spot, an advance of 15 shillings, and £61 3s. 9d. for futures. Best Selected is quoted at £64 5s. Exports for the month so far have amounted to 20,917 tons, with every possibility of reaching 25,000 tons before the close of the month.

Pig Lead.—The Lead market is very strong, with a marked scarcity of spot stock and a good current demand. The American Smelting & Refining Company continues to quote on a basis of 4.20c. for "shipment" Desilverized, in 50-ton lots. Strictly spot Lead in small quantities has been advanced here to 4.37½c. to 4.42½c. St. Louis telegraphs 4.20c. to 4.25c. The London market is higher, at £12 7s. 6d.

Spelter.—The market continues firm, with a fair demand and higher prices for spot stock which is quoted here to-day at 5.30c. to 5.35c. St. Louis is also firmer at 5.20c. to 5.25c. London cables £23 10s., being an advance of 7 shillings 6 pence.

Antimony.—This metal continues very firm. An active demand with limited supplies indicates the probability of still higher prices. Japanese Antimony has been in especially brisk demand. Current prices are: Cookson's, 7.25c. to 7.50c.; Hallett's, 7.12½c. to 7.37½c., and other grades at 6.25c. to 6.75c.

Nickel.—The usual amount of business is passing and prices are steady, large lots being quoted at 40c. to 45c. and smaller quantities at 50c. to 60c.

Quicksilver.—The market has declined. Flasks of 76½ lbs. were quoted to-day at $40. London is unchanged at £7 15s.

Tin Plates.—No special developments are noted in this market. The business is of fair volume for the season of the year and prices are steady. The American Sheet & Tin Plate Company is quoting $3.30 per box, Pittsburgh, for 14 x 20 100-lb. Coke Plates, making the price $3.49, delivered in New York. The Welsh market is unchanged and firm at 11 shillings 9 pence, f.o.b. Swansea.

A souvenir medal commemorative of the establishment of the nickel industry by Joseph Wharton has been coined by the International Nickel Company of New York. It is made of refined nickel and is a beautiful specimen of the coiner's art. The obverse presents a portrait of Joseph Wharton, with this inscription: "Malleable nickel first produced in 1865 by Joseph Wharton, Sc.D., LL.D." The reverse contains the legend: "American Malleable Nickel. International Nickel Company, 1904. St. Louis Exposition."

John R. Searles, heretofore connected with the Berwick plant of the American Car & Foundry Company, sails for Europe this week to take charge of the erection and operation of a plant which the company will establish at some point in England.

Another of the famous Farmer Benner prophecies is out, as follows: "In my predictions I have been guided by the cycle in iron, as explained in my book of prophecies. The ups and downs in trade follow the pig iron cycle persistently. The coming four years after 1904 will be prosperous years for the iron trade. The price of iron will advance; also, the market for railroad stocks and industrial securities, with moderate reactions, will recover the many millions of dollars lost in the decline and the depression of the last few years."

By a decree handed down by the United States Circuit Court in New York, George Westinghouse, Jr., of Pittsburgh, is given a final decision against the New York Air Brake Company, amounting to $128,397.40, with interest from July 27, 1901, for infringements on air brake patents for freight cars. The total, with the master's fees assessed against the New York company, is $154,572.80, which may be increased to something like $200,000 by the Westinghouse court costs, which are also assessed against the New York company.

Iron and Industrial Stocks.

By the displacement of a comma a serious error was made in this department last week in giving the bonded indebtedness of the Virginia Iron, Coal & Coke Company. The figures should have been $6,999,100.

The volume of business on the New York Stock Exchange during the past week broke all records for over two years. Every day the sales exceeded over 1,000,000 shares and on several days approximated or exceeded 2,000,000 shares. The activity was greatest in railroad stocks, but the iron and steel stocks were also participants in the heavy trade. The prices of iron and steel stocks, however, were on a somewhat lower plane than during the preceding week. A severe break occurred in Pressed Steel Car common, which was due to rumors that the dividend for the coming quarter might be passed. The range of prices up to Tuesday evening on active stocks was as follows: Can peeferred, 46 to 48½; Car & Foundry common, 26 to 27⅛; Locomotive common 28 to 29¾, preferred 97¾ to 100½; Cambria Steel, 23⅞ to 24½; Colorado Fuel, 36 to 42; Crucible Steel preferred, 39½ to 42; Pressed Steel common, 36 to 41¼; Railway Spring common, 25¼ to 26; Republic common 11⅞ to 12⅞, preferred 52 to 54½; Sloss-Sheffield common, 45¼ to 46½; Tennessee Coal, 55¼ to 57½; United States Cast Iron Pipe preferred, 63⅛ to 64¾; United States Steel common 20 to 21½, preferred 80¼ to 82⅝, new 5's 85¾ to 87⅛. The last prices on active stocks up to 1.30 p.m. on Wednesday were as follows: Can common 6⅝, preferred 47; Car & Foundry common 26¼, preferred 84¼; Locomotive common 27¼, preferred 99; Colorado Fuel, 41½; Pressed Steel common 34, preferred 80¾; Railway Spring common 24⅞, preferred 86½; Republic common 12, preferred 52½; Sloss-Sheffield common 47½, preferred 96⅞; Tennessee Coal, 56¾; United States Steel common 20⅝, preferred 81⅛, new 5's 87⅜.

The annual report of the Dominion Iron & Steel Company for the fiscal year ended December 31, 1903, submitted at the stockholders' meeting at Montreal, October 19, shows net profits for the year of $341,890; deductions for bad debts of $226,313, and a surplus for the year of $115,576.

At the annual meeting of the stockholders of the Pittsburgh Reduction Company, Pittsburgh, held recently, it was decided to increase the capital stock from $1,600,000 to $3,800,000. This is a close corporation, the directors owning practically all of the stock. The old directors were all re-elected. The Pittsburgh Reduction Company manufactures pure aluminum, maintaining plants at New Kensington and Niagara Falls, N. Y.

The Westinghouse Electric & Mfg. Company of Pittsburgh, has announced that it will issue $15,000,000 20-year 5 per cent. debenture bonds, redeemable on call at 105 and interest. A committee of directors, consisting of Brayton Ives, George Westinghouse and George C. Smith, appointed to consider and report upon a comprehensive plan covering the requirements of the company for a period of years, has reported as follows: "The large and continuous growth of your company's business, its prospective increase and the moderate amount of its share capital, now $25,000,000 all issued, compared with its fixed and working assets of over $50,000,000 and the importance of having in reserve the necessary means of providing capital for the protection and extension of the company's business, have been carefully considered by your committee. It is in our judgment a wise and conservative measure to provide this additional capital in the form of an issue of debentures which can be retired rather than by a permanent increase of capital stock, such debentures to be disposed of at the discretion of the board at such times and in such amounts, not exceeding a reasonable aggregate, as will meet best the company's capital requirements. We accordingly submit herewith a form of debenture agreement, prepared by counsel, securing an issue of debenture certificates of a total authorized issue of $15,000,000 and maturing in 20 years, bearing interest at 5 per cent. per annum and redeemable on call at 105 and accrued interest, and respectfully recommend its adoption for the reason above set forth."

Dividends.—United States Steel Corporation has declared the regular quarterly dividend of 1¾ per cent. on the preferred stock, payable November 30.

Pennsylvania Steel Company has declared the regular semiannual dividend of 3½ per cent. on the preferred stock, payable November 1.

Tennessee Coal, Iron & Railroad Company has declared the regular quarterly dividend of 2 per cent. on the preferred stock, payable November 2.

Otis Elevator Company has declared a dividend of 5 per cent., payable November 1.

A full line of boiler making tools will be put in by the Corinth Engine & Boiler Works, Corinth, Miss., which recently completed a new plant for the manufacture of engines, boiler and sawmill machinery and which is to erect a new boiler shop, 70 x 150 feet. The company informs us that it will be from 60 to 90 days before it is ready to take up the matter of equipment for its new shop.

Some machinery will probably be purchased soon by the Exeter Machine Works, Pittston, Pa., which has secured a plot of ground 250 feet square upon which will be erected an addition to the machine shop, 170 x 180 feet, and an extension to the pattern shop. The new shop will be equipped with modern machinery, including an air compressor, all of which will be operated by electricity, which will be furnished by a new electric power plant. The company has on hand a large number of orders, several of which it received from the Lehigh Valley, Jersey Central and New York Central railroads and the Nassau Light, Heat & Power Company, and is doing a large export business in Mexico, Cuba and Europe. The company is also constructing the Truesdale breaker for the Delaware, Lackawanna & Western Railroad, which is said to be the largest breaker in the world.

A full line of machinery is required by the Chattanooga Stove Works, Chattanooga, Tenn., which desires to correspond with makers of engines, generators, motors and foundry and machine shop equipment. The company was recently organized, and is preparing to erect a plant on a 4-acre plot of ground outside the city limits, to consist of two brick buildings, one, 100 x 275 feet, and one, 100 x 200 feet. J. L. Caldwell, formerly of the firm of Green & Caldwell, hardware dealers, is president and treasurer; G. N. Henson, first vice-president; R. B. Davenport, second vice-president; G. W. Cory, secretary, and H. A. Starr, superintendent.

Manufacturers of power plant equipment will be interested in the new bond issue of $7,350,000 by the Public Service Corporation of New Jersey, which some time ago placed some substantial orders in this market. It is understood that the money received from the sale of the bonds is to be used in improvements throughout the various systems of the corporation, including the enlargement of the gas, electric light and trolley power stations. It will be remembered that the company some time ago prepared specifications for a large power plant on the Hackensack Meadows, near Jersey City, N. J., but has only installed thus far equipment to furnish 10,000 horse-power. As it is the intention eventually to make this one of the largest, if not the largest, station of the company, it is likely that important improvements will be made at this point.

The Pratt Institute, Brooklyn, N. Y., has not yet prepared the list of machinery for the equipment of its proposed new chemistry and mechanical building, but will probably do so within the next three months. Contract for the construction of the building has been let to the Herbert A. Weeks Company, New York.

Water Commissioner Oakley has rejected all bids for the auxiliary high pressure mains for the salt water fire system for Brooklyn and intends to readvertise the specifications. The lowest bid for the work was $650,000.

The M. S. Friede Company, 42 Broadway, New York, has been incorporated to carry on a general export, import and commission business, with branches and agencies on the Pacific Coast, in far Eastern countries and in Europe. The offices of president and general manager have been assumed by M. Sergey Friede, formerly of 71 Broadway, who, it will be remembered, has placed orders here for large amounts of machinery for railroad shops in Russia and in the Far East.

The Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until November 15 to furnish at the navy yards, Norfolk, Charleston and Port Royal, a quantity of motor drive outfits for Bement-Niles horizontal punch, countersinking machines, and Long & Allstatter machines, Davidson and Worthington steam pumps, motor driven service pumps, double acting pumps and various other supplies.

The following awards have been made for supplies for the League Island and Washington navy yards, and the Naval Academy, Annapolis, bids for which were opened September 27:

Niles-Bement-Pond Company, New York, class 73, one 16-inch slotting machine, $1855; class 75, one No. 2 horizontal boring and drilling machine, $2450.

Manning, Maxwell & Moore, New York, class 45, Morse taper shank counterbore, shell reamers, &c., $142.89.

Geo. F. Blake Mfg. Company, New York, class 72, one duplex double acting feed, boiler pump, $203.50.

Crocker-Wheeler Company, Ampere, N. J., class 1, eight electric motors, $2521.50; class 4, one shunt wound direct current motor, $212.

Montgomery & Co., New York, class 44, Cleveland Twist Drill Company's taper reamer, $91.95.

Akron Electric Mfg. Company, Akron, Ohio, class 2, two 3 horse-power electric motors, $276.

Ideal Electric & Mfg. Company, Mansfield, Ohio, class 3, two direct current electric motors, $480.

New York.

NEW YORK, October 26, 1904.

Pig Iron.—For a portion of the week much excitement prevailed in the Pig Iron market. Within the past few days, however, the pressure to purchase has abated considerably. Most of the heavy consumers are quite well covered, but the smaller people are now coming in, so that the market is far from stagnant. Some good inquiries from New England foundries are being considered. The furnaces in this locality are so well sold up that they will be easily able to tide over the remainder of the year and will be in good condition for the opening of 1905. Some sales of Foundry Iron have been made for delivery running well into next year. One of the best features of the present situation is that the demand for finished products is increasing, which gives reason to believe that the Iron purchased will go immediately into consumption. Among the local transactions of the week were sales of basic aggregating some 12,000 tons and a sale of 3000 tons to a machinery builder. The principal Southern producing companies are holding No. 2 Foundry at $12 at the furnace. Quotations at present are as follows: No. 1 Northern Foundry, $15.25 to $15.75; No. 2 X Foundry, $14.75 to $15.25; Gray Forge, $13.50 to $14, at tidewater. Tennessee and Alabama brands are quotable at $14.75 to $15.75 for No. 2 Foundry, and $14.25 to $15.25 for No. 3 Foundry.

Steel Rails.—Sales of Standard Sections are confined to small lots. The price is unchanged at $28, at mill. Light Sections are quoted at $19.50 to $20, at mill.

Cast Iron Pipe.—The bids on the Brooklyn high pressure service have been thrown out, and the work will be readvertised. No reason is assigned. General trade is quiet, but prices are firm. Carload lots are $25 to $25.50 per gross ton for 6 to 10 inch and $24 to $25 for 12-inch, at tidewater.

Finished Iron and Steel.—Very good business is reported in Structural Material. The demand has been greatly accelerated by the orders recently placed for Steel cars and for shipbuilding on the Great Lakes. A better demand is also coming from the smaller contractors throughout the country who are engaged in the erection of buildings. Large building operations, however, are not much in evidence at present, capitalists apparently waiting until after the Presidential election. The bridge business is quiet, but more inquiries are now coming from Western railroads, and it is expected that orders will soon develop from that quarter. The Plate trade is steadily improving, as the shops in this vicinity are now much better employed than during the summer months. So far, the demand for Plates is principally for repair work, but it is expected that new work will shortly become more abundant, when larger quantities will be needed. The Eastern Bar Iron manufacturers have reaffirmed prices, and report a considerably better condition of business. Quotations, at tidewater, are as follows: Beams, Channels, Angles and Zees, 1.54½c. to 1.80c.; Tees, 1.59½c. to 1.80c.; Bulb Angles and Deck Beams, 1.64½c. to 1.85c.; Sheared Plates, in carload lots, 1.54½c. to 1.65c. for Tank, 1.64½c. to 1.80c. for Flange, 1.74½c. to 1.90c. for Marine, and 1.74½c. to 2.50c. for Fire Box, according to specifications; Refined Bar Iron, 1.44½c. to 1.49½c.; Soft Steel Bars, 1.44½c. to 1.49½c.

Old Material.—Business has been very much better. The demand covers practically everything on the list and prices show some advance. Among the sales reported for the week are 2000 tons of No. 1 Machinery Cast, 1000 tons of Scrap Steel and 4000 tons of Relaying Rails, which were sold by an Eastern road to a dealer. The advance in Scrap prices is deprecated by leading dealers, who would prefer to see an advance in the Finished product before much of an advance in Old Material, as the market would then be more healthy. Prices per gross ton in New York and vicinity are approximately as follows:

Old Iron Rails	$15.50 to $16.00
Old Steel Rails, rerolling lengths	13.00 to 13.50
Old Steel Rails, short pieces	11.50 to 12.00
Relaying Rails	16.00 to 17.00
Old Car Wheels	11.50 to 12.00
Old Iron Car Axles	17.00 to 17.50
Old Steel Car Axles	14.50 to 15.00
Heavy Melting Steel Scrap	11.50 to 12.00
No. 1 Railroad Wrought Scrap	13.50 to 14.00
Iron Track Scrap	11.50 to 12.00
Wrought Pipe	9.50 to 10.00
Ordinary Light Iron	7.00 to 8.00
Cast Borings	5.50 to 6.00
Wrought Turnings	7.50 to 8.00
No. 1 Machinery Cast	11.00 to 11.50
Stove Plate	9.00 to 9.50

St. Louis World's Fair Awards.

Electricity Building.

Following is a list of the awards made to exhibitors in the Electricity Building at the St. Louis World's Fair:

United States, Group 67, Grand Prizes.

Bullock Electric Mfg. Company, grand prize for alternating current generators and synchronous motors, direct current generators, motors and rotary converters.

General Electric Company, first grand prize, complete alternating current turbo-generator installation, alternating current generators and motors, static transformers and rotary converters; second grand prize, direct current generators and motors; third grand prize, electric railway motors and control systems for single and multiple unit operation and for mining and industrial locomotives.

Westinghouse Electric & Mfg. Company, first grand prize, alternating current generators and motors, alternating current turbo-generator installation, static transformers and rotary converters; second grand prize, current generators and motors; third grand prize, electric railway motors and control systems for single and multiple unit operation and for mining and industrial locomotives.

United States, Group 67, Gold Medals.

Bullock Electric Mfg. Company, multivoltage system of motors control.

Burnham, Williams & Co., electric railway trucks and locomotives.

American Steel & Wire Company, wires and cables for electric light and power.

Crocker-Wheeler Company, direct current generators.

Electric Controller & Supply Company, controllers, automatic switches and lifting magnets.

General Electric Company, first, complete switchboard and controlling apparatus and application of electric motors for mechanical purposes; second, mercury arc rectifier.

Locke Insulator Mfg. Company, high voltage insulators.

National Electric Company, first, electric air brake equipment; second, alternating current generators.

Pawling & Harnischfeger, electric equipment and control for cranes, hoists and trolleys.

Safety Insulated Wire & Cable Company, electric wires and cables.

Standard Underground Cable Company, electric wires and cables.

R. Thomas & Sons, high voltage insulators.

C. H. Thordarson, high voltage transformer and electric laboratory appratus.

Wagner Electric Mfg. Company, single phase motors and transformers.

Westinghouse Electric & Mfg. Company, complete switchboards and controlling apparatus and the application of electric motors for mechanical purposes.

Western Electric Company, direct current generators and motors.

United States, Group 67, Silver Medals.

Bullock Electric Mfg. Company, railway motors and controllers.

H. B. Camp Company, vitrified clay conduits.

Jas. Clark, Jr., & Co., electric motors forming an integral part of machine tools.

Commercial Electric Company, direct current motors and generators.

Commercial Electric Company, direct current motors and generators, machine tool applications, system of speed control.

Electric Railway Equipment Company, electric railway overhead material, poles and appliances.

Eureka Tempered Copper Works, copper and brass products for the electrical industry.

Fort Wayne Electric Works, first, alternating current generators, motors and transformers; second, direct current generators and motors.

Gould Storage Battery Company, storage battery boosters and control system.

C. W. Hunt Company, electric storage battery locomotives.

Indiana Rubber & Gutta Percha Insulating Company, wires and cables for light and power.

Kohler Bros., push button electric control for printing presses.

McRoy Clay Works, first, vitrified clay conduits; second, exhibit of complete conduit system and manholes.

Morgan Electric Machine Company, electric third rail haulage system.

National Electric Company, direct current generators and motors.

Northern Electrical Mfg. Company, direct current generators and motors and application of motors to machine tools.

Purdue University, high potential transformer.

Stanley Electric Mfg. Company, inductor generator.

Triumph Electric Company, direct current generators and motors.

United States, Group 67, Bronze Medals.

American Engine Company, direct generator and switchboard.

The Browning Company, direct current generators and motors.

Burdett-Rowntree Mfg. Company, automatic electric control for dumb waiters.

Diehl Mfg. Company, sewing machine motors.

Electrose Company, electrose insulating material.

Fairbanks, Morse & Co., direct current dynamos and motors.

C. J. Field, glazed clay conduits.

G. M. Gest, exhibit of conduit system for underground circuits.

Hunter Fan & Motor Company, electric ceiling fans.

Jandus Electric Company, desk and ceiling fans.

Moloney Electric Company, alternating current transformers.

Ohio Brass Company, electric railway supplies.

Peerless Electric Company, direct current generators, motors, fans and transformers.

Shedd Electric & Mfg. Company, oscillating electric fans.

Sterling Electric Motor Company, direct current motors.

Walker Electric Company, switchboard.

Warren Electric Mfg. Company, alternating current inductor generators.

Robbins & Myers Company, direct current generators and motors and electric fans.

McClure Fire Brick Hot Blast Stoves.

The following McClure (Massicks & Crooke) fire brick hot blast stoves, of which G. W. McClure, Son & Co., engineers and contractors, Bessemer Building, Pittsburgh, Pa., are the sole representatives, have been erected within the past seven years at the following places:

	Number.	Diameter. Feet.	In.
United States Steel Corporation.			
Carnegie Steel Company, Rankin, Pa.	12	21	0
	2	19	6
Carnegie Steel Company, New Castle, Pa.	9	21	0
	1	19	6
Carnegie Steel Company, Mingo Junction, Ohio	4	21	0
	4	19	6
	1	20	0
Carnegie Steel Company, Ohio Works, Youngstown, Ohio.	4	21	0
Carnegie Steel Company, Columbus Works, Columbus, Ohio.	3	19	6
Carnegie Steel Company, Clairton, Pa.	12	21	0
National Tube Company, Riverside Department, Wheeling, W. Va.	4	21	0
American Steel & Wire Company, Shoenberger Works, Pittsburgh, Pa.	1	18	0
American Steel & Wire Company, Edith Furnace, Allegheny, Pa.	1	21	0
American Steel & Wire Company, Central Furnace, Cleveland, Ohio.	1	21	0
	1	20	0
Republic Iron & Steel Company.			
Pioneer Mining & Mfg. Company, Thomas, Ala.	6	21	0
Hannah Furnaces, Youngstown, Ohio.	2	18	0
Other Companies.			
La Belle Iron Works, Steubenville, Ohio.	8	21	0
Reading Iron Company, Reading, Pa.	4	19	6
Lebanon Furnaces, Lebanon, Pa.	4	20	0
Cherry Valley Iron Company, Leetonia, Ohio.	3	21	0
Campania Fundidora de Fierro y Acero de Monterey, Monterey, Mexico.	4	19	6
Thomas Furnace Company, Milwaukee, Wis.	2	18	0
Girard Iron Company, Girard, Ohio.	1	20	0
Ashland Iron & Mining Company, Ashland, Ky.	1	18	0
They have now in course of erection for			
Wheeling Steel & Iron Company, Martins Ferry, Ohio	4	20	0
Shenango Furnace Company, Sharpsville, Pa.	4	19	6

G. W. McClure, Son & Co., prior to the seven-year period thus covered, erected a large number of their type of stoves for many other prominent concerns as well as many of the above named companies, as the pioneer set of stoves was built about 17 years ago.

The American Steel Foundries, 74 Broadway, New York, has established a sales office in Cleveland, at 712 Hickox Building, with W. S. Walsh in charge.

The Production of Aluminum in 1903.

WASHINGTON, D. C., October 25, 1904.—The production of aluminum in the United States during 1903 surpassed that of any previous year in the history of the industry, according to the annual report of the United States Geological Survey, which has been completed by Dr. Joseph Struthers. The output is estimated at 7,500,000 pounds, as compared with 7,300,000 pounds in 1902 and 7,150,000 pounds in 1901. It has not been possible to obtain exact statistics of the production of aluminum for the reason that the sole producer in the United States, the Pittsburgh Reduction Company, declines to state, even approximately, its output. But judging from the extension of the uses of the metal and its alloys for such constructional and decorative work as requires lightness and no great strength, together with the increased quantity of aluminum, in the form of wires and bars, used to replace copper for conducting electric current, it is fair to assume that the production of the light metal in the United States is steadily on the increase. This assumption is strengthened by the fact that the quantity of bauxite (the crude mineral from which aluminum is extracted) consumed during the last few years has been successively larger and larger, the consumption being based on the domestic production plus the quantity imported.

The chief point of interest affecting the aluminum industry in the United States during the year 1903 was the final adjudication of the many law suits and counter law suits which from time to time have been instituted in behalf of the Electric Smelting & Aluminum Company of Cleveland, Ohio, and the Pittsburgh Reduction Company. In October, 1903, the United States Court of Appeals rendered a decision against the Pittsburgh Reduction Company (operating the Hall patents) for infringement, since 1892, of the rights of the Electric Smelting & Aluminum Company, operating the Bradley patents. The sum involved was approximately $3,000,000. On October 13 a friendly agreement was entered into by the two companies to the effect that the Pittsburgh Reduction Company should pay a given sum for the quantity of aluminum made by it up to the date of the agreement, and should continue the manufacture of aluminum under license of the Bradley patents until the time of their expiration—in February, 1909—paying a royalty for all metal produced in the future; the operation of the Electric Smelting & Aluminum Company is to be restricted to the manufacture of aluminum alloys, although it may handle and sell aluminum in all forms at the works of the company at Lockport, N. Y. The settlement involved also an agreement by the Electric Smelting & Aluminum Company not to appeal the old case of the Pittsburgh Reduction Company *vs.* the Cowles Electric Smelting & Aluminum Company, wherein the latter was enjoined by the United States Circuit Court from manufacturing aluminum metal. By the terms of the agreement there will be no future litigation between the two companies.

The Electric Smelting & Aluminum Company apparently now controls the electric smelting industry in the United States, as, in addition to the electric smelting of aluminum, the following companies are more or less subsidiary to it: The Cowles Smelting Company, Union Carbide Company, British Aluminum Company, Electric Gas Company, Acetylene Illuminating Company, Wilson Aluminum Company and Acetylene Company.

Progress in 1903.

The new plant of the Pittsburgh Reduction Company, at Massena Springs, N. Y., was put into operation in Septebmer, 1903. The equipment includes four 300 horsepower sets generating current at 500 volts, and provision is made to extend the works up to a consumption of 12,000 horse-power should the increasing demand warrant the outlay. The St. Lawrence Water Power Company at present supplies the electric current used in the extraction of the metal. In addition to the manufacture of aluminum, this company has installed a plant for the manufacture of carbon electrodes used in the reduction furnace, and has also a wire mill under construction. The company now has the large capacity of 17.200 horsepower, which is equivalent to 4850 tons of metal yearly, a quantity that almost equals the combined output of the European producers. It has two plants at Niagara Falls, N. Y., the upper one using 4000 horse-power, near the grounds of the Niagara Falls Power Company above the Falls, and the lower one, on the edge of the gorge, using 6500 horse-power, supplied by the Hydraulic Power & Mfg. Company. The Pittsburgh Reduction Company was the first manufacturing plant to use the power of the Niagara Falls Power Company in 1893, and, as an inducement, it is understood that a contract was entered into for the supply of electric current at a cost not exceeding $18 per horse-power per year, including the installation by the power company of transforming machinery at the aluminum plant. The daily output of the lower plant, which is operated exactly in the same manner as the upper one, is about 11,000 pounds of metallic aluminum, which gives a total daily output from both plants of the company approximating 19,000 pounds.

Despite the increasing demand for aluminum, due to the extension of its uses both as metal and as alloys, the price per pound has continued practically stationary throughout the years 1901, 1902 and 1903. The price of ingot aluminum during 1903 was adjusted by an agreement between all of the aluminum producers in the world.

W. L. C.

Labor Notes.

The strike of the boiler makers, which went into effect in all the shipyards on May 4 against the New York Metal Trades Association, was ended last Friday by the unconditional surrender of the men employed by the W. A. Fletcher Company, a member of the association, whose shops are located in Hoboken, N. J. The men applied for reinstatement at the company's shops, but only two were taken back. They went to work on the understanding that no walking delegates could enter the shops or interfere with the men; that the open shop rule must prevail, and that the men must work harmoniously with the nonunion men.

At the National Works of the American Sheet & Tin Plate Company, Monessen, Pa., the hot mill employees were recently paid a bonus of $18,000 for faithful and continued service with the company, being 5 per cent. of the net earnings of the men for the past year. The National Works is one of the largest plants owned by the American Sheet & Tin Plate Company and contains 24 26 x 32 inch hot mills and 20 22 x 32 inch cold mills, the annual output being 35,000 gross tons of black plate for tinning. A number of innovations are in practice at this plant, one of these being a bonus of 5 per cent. to employees for faithful service for an entire year. The National Works has a record for tonnage turned out in black plate and also for low cost of manufacture that is highly pleasing to the officials of the American Sheet & Tin Plate Company.

Everything appertaining to the molders' strike in Cincinnati is quiet. Six of the foundries are running with approximately a full force, and it is said that two others will be open for business this week. From reports received there is apparently no trouble in securing all the good men needed, and skilled nonunion men are rapidly taking the places of the former employees now on strike. The shops now running and those about to be started are open shops, a number of union men, however, being taken back as individuals. There have been no serious outbreaks for several weeks, and since the court has been appealed to and injunction notices served, as well as a number of arrests for contempt of court made, it is anticipated that no further trouble will ensue.

Col. H. G. Prout, first vice-president and general manager of the Union Switch & Signal Company, and former editor of the *Railroad Gazette*, has been elected a director of the Westinghouse Air Brake Company, to fill the vacancy caused by the death of the late Henry W. Oliver.

New Publications.

Ready Reference Tables. Vol. 1. Conversion factors of every unit or measure in use, based on the accurate legal standards of the United States. Conveniently arranged for engineers, physicists, students, mechants, &c. By Carl Hering, M.E. Publishers: John Wiley & Sons, New York; Chapman & Hall, Limited, London. 196 pages. Morocco binding. Price, $2.50.

This is the first of several volumes in preparation by the author intended to contain collections of data conveniently arranged for ready reference. In this first volume all the various measures used in practice, more especially by engineers and physicists, are given, with their values in terms of associated measures. The reciprocals are also given, enabling every calculation of conversion to be reduced to simple multiplication. Many obsolete units which are occasionally met with are included with those of standard practice, and some of the more common foreign units or measures are also added. These conversion factors are not compiled, but have been specially recalculated for this volume from the exact legal values, as far as such values existed, and from the best standard and authoritative values obtainable when no legal values existed. The authority for each fundamental value is given. The quantities of which units or measures are given include length, surface, volume, capacity, weight, weight and length, pressure, weight and volume, weight of water, energy, heat, power, force, inertia, moments, velocity, acceleration, angles, grades, time, electricity, magnetism, electro-chemistry, light, temperature, money, money and length, money and weight, numerous compound units, useful functions and numbers, &c., and of these are given their accurate and approximate values, their logarithms, relations, digit conversion tables, explanations of calculations, &c. This is believed to be the first complete set of conversion factors of all measures which has been published based on the accurate legal standard values, and the first complete collection of electric, magnetic and photo-metric units given with their interrelations that has been published in convenient tabular form. Accuracy is a prime requisite, and extreme precaution has been taken in the checking of all figures, so that it is believed to be free from error. A valuable feature is that the value of most of the compound units are given, saving double or triple or even more lengthy calculations, in which errors are likely to be made. The present tables are an extension and entire recalculation of the very much smaller ones published by the author about 20 years ago under the title of "Equivalents of Units of Measurements." A complete index is appended for assisting in locating references, and a condensed list is printed on the inside cover and first fly leaf which contains the most frequently used values, with page reference to the others. The need of such a book has long existed, and it will undoubtedly be enthusiastically received by the professions concerned.

Steam Boilers; Their Theory and Design. By H. de B. Parsons, B.S., M.E., Consulting Engineer. Publishers, Longmans, Green & Co., New York. Pages, 387.

This volume is intended for the use of engineers and engineering students, and was based on a series of lectures delivered by the author at the Rensselaer Polytechnic Institute, Troy, N. Y. It treats of the theory of the steam boiler and of the combustion and the methods for obtaining the best results in practice. The different forms of steam boilers and of steam generators are explained and rules are given for determining the strength and the sizes of all the parts entering into them. Empirical rules are given whenever possible, and their uses and limitations explained. The book also contains chapters on mechanical stokers, chimney draft, both natural and artificial; incrustation, corrosion, chimney design, smoke prevention, and care of boilers. The drawings are, as far as possible, working drawings, many of them selected from designs made by the author of boilers actually constructed and in operation. The book will be found a practical textbook for the student, and a valuable reference for the practicing engineer, as it covers many of the perplexing questions which it is difficult to find explanations for in existing works.

The Architects' and Builders' Pocket Book. A hand book for architects, structural engineers, builders and draftsmen. By Frank E. Kidder, C.E., Ph.D., consulting architect and structural engineer, Denver, Col. Fourteenth edition. Rewritten. Publishers: John Wiley & Sons, New York; Chapman & Hall, Limited, London. 1656 pages. Morocco binding. Price, $5.

The first edition of this work was brought out nearly 20 years ago, its object then, as now, being to supply a hand book which should be to the architect and builder what Kent's pocket book is to the mechanical engineer and Trautwine's is to the civil engineer. The book has constantly been revised from time to time, and this last edition—the fourteenth—has been almost entirely rewritten. The aim has been to produce a reference book which contains some information on every subject (except design) likely to come before an architect, structural engineer, draftsman or master builder, including data for estimating approximate costs, and to cover the subject of architectural engineering as thoroughly as is practicable in a hand book, and to present all information in as small and convenient form for immediate application as is consistent with accuracy. A review of the work shows that the author's aim has been very consistently realized, and the value of the work to the profession it has been prepared for can hardly be overestimated. The tremendous advance in building practice since the first edition accounts for the greatly increased scope necessary in the present work. Originally structural engineering referred almost exclusively to bridge work, while to-day it is a most important part of building construction. For this reason this hand book has been extended to serve the needs of the structural engineer and draftsman as well as the architect and builder. The book contains many references to other sources of information where it was impossible from lack of space to go extensively into any subject. Another noteworthy feature is a general index to many lines of work, materials and manufactured products entering into the planning, construction and equipment of buildings. An interesting section gives the names of architects of noted public and semipublic buildings in the United States, and a list of noted architects from the seventh century B.C. down to the present, and a more complete list of noted American architects, with a brief item concerning each and his principal works. Colleges and schools of architecture receive consideration in another division. "Trade References" will be found convenient to architects in locating manufacturers of classes of goods they are apt to require. The book closes with a glossary of technical terms, ancient and modern, used by the profession, and architectural terms as defined in various building laws.

Interborough Rapid Transit.—The New York Subway, Its Construction and Equipment. Planned and executed by the McGraw Publishing Company, New York. Published by the Interborough Rapid Transit Company. Pages, 154. Cloth.

We are indebted to W. M. Probasco, 114 Liberty street, New York, for a copy of this work, which makes its appearance synchronously with the opening of the Subway to the use of the public. It gives a complete history of the efforts to introduce underground transportation in the City of New York, together with a comprehensive description of the great engineering undertaking now finished. The details of construction are exhaustively treated, and the methods adopted to overcome the formidable difficulties encountered are lucidly explained. The book not only treats of the peculiar features of the Subway, but describes the power house buildings, the power plant from coal pile to shafts of engines and turbines, the system of electrical supply, the electrical equipment of the cars, the lighting system for passenger stations and tunnel, the rolling stock, the signal system, the drainage and the repair and inspection shed. The book is 10½ x 14 inches, which enables large illustrations to be used, so that none of the details is cramped. It is very profusely illustrated and enters thoroughly into engineering and architectural drawings. The work will not only be appreciated as a souvenir, but will undoubtedly be valued highly as a book of reference by the engineering fraternity.

Trade Publications.

Perforated Metal.—The Harrington & King Perforating Company, Chicago, advertises the great scope and diversity of its operations by means of a series of booklets illustrating leading types of perforated metal. No. 1 is devoted to perforated brass and tin, the 19 illustrations showing a wide range of perforations, from its No. 0, containing 25 holes per lineal inch and 625 per square inch, to its No 8, containing five holes per lineal inch or 25 per square inch. The holes in the small size are 0.02 inches in diameter, and No. 8, 0.138. Booklet No. 2 describes perforated metal for sugar, coffee and rice machinery in brass, copper, steel, zinc or galvanized iron, including perforated brass or copper for centrifugal machines. Filter press plates made of brass, copper, bronze, steel and iron are illustrated, as well as perforated metal for extractors, strainers, squeezers, oil, feed and starch presses, coffee coolers, rice sieves, &c. The perforations are made circular or oblong, with rounded corners or with rectangular corners, and either parallel to the sides of the sheet or diagonal. Booklet No. 3 is devoted to stamp battery screens and other perforated plate work for stamp mills, grinding mills, pulverizers, extractors, coal mines, clay, cement, sand, gravel, macadam and phosphate operations. Special emphasis is laid on the Duro steel furnished by this company in its steel screens in any dimensions up to 36 x 120 inches. Battery screens are shown in 12 varieties for diagonal slots, as well as a line showing the indented or burred slots, both straight and diagonal. Round hole screens for stamp battery are shown in six sizes. While these three booklets illustrate a wide range of work, they are only suggestive of the great scope and diversity of perforated work that is being turned out at this plant.

Centrifugal Pumps.—The De Laval steam turbine driven centrifugal pumps are the subject of bulletin series T, No. 7, from the D'Olier Engineering Company, Philadelphia, Pa., a number of sets being shown photographed in actual operation. Parts of the turbine and a centrifugal pump are also illustrated, and the reading matter discusses the construction and performance. Electric motor driven De Laval pumps also have a part in the description. Additional half-tones show the De Laval turbines connected to electric generators.

Gear Planers.—The Gleason Works, Rochester, N. Y., has recently brought out a beautiful catalogue of gear planers, 9 x 12 inches in size. The first eight pages contain printed matter and line engravings. These include a description of a 15-inch shearing cut bevel gear planer, which was given in *The Iron Age* of June 23, and similar descriptions of automatic gear planers for bevel gears, planers for bevel and spur gears, and planers for large spur gears of the type that was described in *The Iron Age* of March 31. The remainder of the book is composed of half-tone engravings mounted on green cartridge paper leaves matching the cover. These half-tones show a 15-inch automatic shearing cut bevel gear planer; 24, 36 and 48 inch automatic bevel gear planers; 77-inch gear planer for bevel and spur gears; another of the same type with attachment for wooden gears and patterns; a 144-inch gear planer for spur gears, and a 240-inch spur gear planer. The last two pages give line cuts and dimensions of mandrels for use on various sizes of bevel gear planers.

Steam Turbine Test.—The Westinghouse Machine Company, East Pittsburgh, Pa., has prepared a publication which is a *fac-simile* typewritten report, being a steam turbine test made by Dean & Main, consulting engineers, Boston, Mass., of a 400-kw. Westinghouse-Parsons steam turbine, and includes blue print curves for steam consumption. When running with approximately 100 degrees F. superheat, the steam consumption was 12.07 pounds per brake horse-power at 31 per cent. overload; 12.41 at full load; 12.86 at 77 per cent. load, and 14.62 at 41 per cent. load. With 180 degrees superheat 32 per cent. overload, the water rate was 11.17 pounds and at full load 11.45. With dry saturated steam the results were 13.63, 13.91, 14.48 and 16.06 at 26 per cent. overload, full load, 77 per cent. load, and 42 per cent. load, respectively. In all the foregoing tests the vacuum was 27 inches or better. With dry steam and a low vacuum, about 25.9, the water rate was 14.01 at 20 per cent. overload and 14.35 at full load.

Pumping Machinery.—Henry R. Worthington, 114 Liberty street, New York City, is distributing a reprint of the articles on "Pumping and Air Compressing Machinery at the St. Louis Exposition," which appeared in *The Iron Age* of July 21 and 28.

Pumps and Hydraulic Machinery.—A supplement to its general catalogue has been issued by the Goulds Mfg. Company, Seneca Falls, N. Y. This illustrates and gives specifications of several new styles of goods not heretofore catalogued. These include a duplex double acting piston vacuum pump, two single acting triplex plunger pumps, an electric triplex worm gear pump, a two cylinder force pump and fire engine, a two cylinder contractor or bilge pump, hand pumping apparatus for deep wells, manual power pumping apparatus, a Columbia double cylinder force pump and a two-wheel truck on which to mount portable pumps.

Standard Bolt Cutters and Pipe Threaders, manufactured by the Norwalk Mfg. Company, Norwalk, Ohio, are described in a circular from that concern, which gives illustrations of the standard design, with a table of measurements and a brief account of the particular features of construction and points of advantage.

Engines.—The Wm. Tod Company, Youngstown, Ohio, has issued a handsome booklet, profusely illustrated, containing an account of its engine building plant and facilities. The company was founded in 1856 and in 1901 was incorporated and the plant enlarged. These improvements, as they exist at the present time, are a feature of the description.

Boring and Turning Mills.—A handsome catalogue of vertical boring and turning mills and their attachments has recently been published by the Betts Machine Company, Wilmington, Del. The catalogue is 6¾ x 9¾ inches and contains 60 pages, the even numbered pages containing illustrations and the odd numbered pages descriptions of the accompanying machines. A word at the outset speaks of the advantage of worm drive instead of spur gear drive for small mills running at high speed. This drive is adopted on the 5, 6 and 7 foot mills, descriptions and illustrations of which follow. A line of larger mills is then taken up, including an 8-foot boring and turning mill, also shown with single motor drive and with separate auxiliary motor for elevating the cross rail. A standard 10-foot mill is next shown and also one of extra heavy pattern. Following are a 12-foot standard and 12-foot extra heavy mill; a 14-foot mill, standard and extra heavy, and a 16-foot mill. Extension boring and turning mills are next treated, these being of 7 to 10 foot, 10 to 16 and 14 to 20 foot sizes. Special boring mills and attachments occupy the remainder of the book, these being, in order, tire turning and boring mills, car wheel boring mill, slotting attachment, threading and grooving attachment, a grooving head, cylinder boring attachment, pulley turning attachment and special boring head. A list of users is appended.

Electric Motor Controlling Apparatus.—From the Cutler-Hammer Mfg. Company, Milwaukee, Wis., have recently been received several new bulletins. No. 52 shows C. & H. self starters, with reversing switches, for freight elevators, dumbwaiters, &c. It gives prices and diagrams for connecting. Bulletin No. 67½ shows compound nonreversible drum controllers for printing presses, machine tools, &c., and gives a complete description. Bulletin No. 73 describes controlling outfits for small motor driven pumps for operating compression tanks and also for use in connection with open tanks, giving list of prices of various sizes and connection diagrams. Bulletin No. 75 shows compound nonreversible machine tool controllers, slate front type, giving prices, description, dimensions and diagram. Bulletin No. 76 describes slate front controllers of similar form, fully reversible instead of being nonreversible. Bulletin No. 77 shows nonreversible controllers of the same class as those shown in Bulletin 15, but of drum type, also giving prices, description, dimensions and diagram. Bulletin No. 78 shows compound fully reversible machine tool controllers of the drum type, giving the same information as before. Bulletin No. 79 is concerned with compound resistances for use only in connection with slate front rheostats, illustrated in bulletins Nos. 75 and 76, and drum controllers, illustrated in bulletins Nos. 77 and 78. It also gives dimensions of resistances for compound slate front type machine tool controllers. Bulletin No. 92 gives list prices of "Simplicity" type interlocking dimmers, interlocking and non interlocking dimmers, single plate dimmers, types 3 and 4, and dimensions. Bulletin No. 93 illustrates and lists resistance units of the Carpenter type, wound on heavy porcelain base.

Steam Accumulator.—The Worthington steam hydraulic accumulator is described in bulletin No. 100, published by Henry R. Worthington, 114 Liberty street, New York City. This device consists of an ordinary steam cylinder combined with a ram cylinder similar to that of a weighted hydraulic accumulator, and is applicable to all purposes requiring storage of water under high pressure. Its advantages over the weighted accumulator are that it is cheaper, occupies less room and is free from the shocks and fluctuations of pressure due to the momentum of the heavy weights used on weighted accumulators.

NOTES.

The Pope Mfg. Company, Hartford, Conn., has issued a little pamphlet called "Motor Puffs," which is concerned with motor cycles. This is largely made up of testimonial letters from users of Columbia, Cleveland and Tribune motor cycles.

The Stiles-Morse Company, 16 South Canal street, Chicago, Ill., is distributing a leaflet bearing an illustration of the Kinseyburt filing machine. A description of the machine is given and the uses to which it is adapted, such as the making of blanking, trimming and coining dies, gauges, templates and models and light slotting work, which ordinarily require the most skillful hand filing. With it may be used any kind of a file, any length or shape of shank, round, square or tapered. It gives a stroke of from 0 to 4 inches at either 200 or 700 strokes per minute, the slow speed being for iron filing and the fast speed for brass and other soft metals. The Stiles-Morse Company is also mailing a small pamphlet on the Bliss machinery—presses, shears, &c.—for which this company is the Western agent. This gives considerable information with regard to each machine shown, while a smaller circular gives illustrations of several improved machines, but with less descriptive matter.

The Ingersoll-Sergeant Drill Company, 26 Cortlandt street, New York City, is distributing pamphlet No. 337, entitled "Before and After," which shows the striking difference between the quarry of the Cleveland Stone Company at North Amherst, Ohio, at the time in which all its machinery was operated by steam, and at the present, when they are using compressed air. The most impressive difference is the saving in expense, the sum for a day before the changes were made being $337.75 and only $172.80 under the new system.

HARDWARE.

THE two questions of special brands and catalogue house competition are in some respects at least closely related. The products of some leading manufacturers, largely, though not exclusively, in the line of Tools, are offered by catalogue houses at prices which are, to say the least, uncomfortably close for some Hardware merchants, being below the figures at which such goods are frequently sold by them. These goods are, indeed, in most cases those that have a national reputation and the prominent goods in their respective lines. To meet this condition of things jobbers' brands are urged on the merchants on the plea that such brands are not quoted by the catalogue houses and that their handling is therefore more advantageous to the retail merchants.

The jobbers are evidently aware of the force of this argument, and in the present movement on the part of manufacturers against special brands, they are endeavoring to fortify themselves by urging it upon the trade. They are, indeed, in some cases going further in this direction than heretofore, as illustrated in the fact referred to in another column that a prominent jobbing house is putting on the market a full, if not complete, assortment of Mechanics' Tools in varying quantities of a sixth of a dozen or more, according to the salability of the various articles. These goods are sold at a given price for the assortment with the understanding that the dealer can replenish his stock by purchasing the goods in any quantity, no matter how small. As an inducement to handle this special brand the dealer is given the exclusive sale in his locality. The competition not only of catalogue houses, but also of the local merchants, is thus avoided.

Notwithstanding the objections which on many grounds hold against special brands, it will be recognized that there is force in the contention that special brands have their advantages in such cases. Whether these advantages are sufficient to counterbalance the disadvantages and to outweigh the almost universal preference of the trade for the manufacturers' brands for the best goods is questionable. It is, however, evident that this phase of the special brand question must be carefully considered by the manufacturers who are opposing the practice. There is enough plausibility in these arguments in favor of special brands to make it advisable for the manufacturers who are attempting to diminish their sale to give this phase of the subject their careful and practical consideration. The manner in which the catalogue house question and that relating to special brands are thus interrelated furnishes another substantial reason for manufacturers seeing to it that their goods if sold by catalogue houses are quoted at prices which will leave the retail merchant an opportunity to handle them at a living profit, and thus remove from him the temptation to take up the sale of special brands as noncompetitive goods.

A canvass of the papers read before the various retail Hardware associations the present year discloses a high character of effort on the part of writers of these papers, which reflects credit both on the writers and upon the associations, but the papers have in many instances dealt too largely in generalities and truisms to be of the most practical service to the members hearing or reading them. If the secretary of each association, or the person responsible for the programme, should canvass the field and make use of information obtained by correspondence from traveling salesmen, as well as his own intercourse with the members, he could pick out what might be called specialists with a view to having papers read at the next session that would be in the nature of expert information and suggestion relating to special subjects. Let him, for instance, select some practical subject on which suggestion will be useful to Hardware merchants, and then go over the membership lists with a view to picking out the one man who is best fitted to write intelligently upon the topic in question, instructing him beforehand to confine his remarks as much as possible to a definite and practical treatment of the subject in hand.

There are in every association men who have made something of a specialty of some line of work or some original method who would be willing to give to their fellow merchants the benefits of their experience. It is needless to point out the value to the conventions of such papers on particular phases or details of the business when presented by men who have given thought and attained some measure of success in pursuing the methods which they describe. The result of this policy would be not only quickly to increase the attendance at the conventions, but would strengthen the membership of the associations in view of the practical value of the organization.

Condition of Trade.

There is an increased volume of current business now that the season is well under way, and merchants, whether wholesale or retail, find their stocks moving gradually and regularly in the presence of a fair, if not especially heavy, demand. The feeling of uncertainty in regard to the market is giving place to a more confident tone. The strength of the Iron market has something to do with this and also the course of prices in the stock market, notwithstanding the fact that these are doubtless to some extent the result of manipulation. The assurance of an important increase in the agricultural wealth of the country as the result of the fine crops and the prospect of the stimulation of industry as the proceeds of these crops enter into commercial channels contribute largely to the hopeful feeling that prevails. Prices as yet, even in the heavy goods, which showed the most marked decline from former values, are not much affected, but in some lines there is a perceptibly better feeling, and extremely low quotations are being withdrawn. A remarkable fact of the general situation for a Presidential year is the confidence that, whatever may be the result of the political canvass, commercial and financial matters will continue undisturbed, so that the general expectation is for a good finish to the year and an excellent trade in 1905, unless something unforeseen interferes with the present prosperity of the country. All along the line there is evidence of good feeling, and manufacturers and merchants are prosecuting business with a more aggressive and enterprising spirit than for some time. At this season in Hardware there is a special activity in winter and holiday goods; but in other branches there is also a steady and wholesome business doing. Collections generally are reported satisfactory, with no especial reason for complaint.

Chicago.

Wire Cloth manufacturers have announced their price for 1905, which is on the basis of $1.10 to jobbers, Chicago, for shipment into stock and the same price at mill, with freight allowed as far West as the Mississippi River. Among the new firms to enter the field are the National

Wire Cloth Company, whose mill is at Niles, Mich., and which is already weaving, and the American Wire Cloth Company at Clinton, Iowa, which will be ready to start its machine in December. Some heavy contracts have been taken already and business is opening up well for next summer's consumption. Last year's price on Poultry Netting has been affirmed on the basis of 80 and 25 per cent. discount to jobbers and 80 and 15 per cent. discount to retailers for Netting that is annealed after weaving, with an extra 5 per cent. discount to retailers for Netting that is made from Annealed Wire. While the price of Nails has not advanced, the tone is considerably stronger and buying is more active than is usual as late as this. Barb and Smooth Wire are still very active commodities. A record-breaking trade is being done in Husking Gloves and Husking Tools. Business in Floor and Side Wall Registers, Hods, Scoops, Pipe, Elbows and Stove Boards is very satisfactory, the price on Registers, however, being so low that manufacturers would willingly see their sales less if they thought a higher price could be adopted and maintained later on. A move in this direction is on foot. No official action has been taken as far as is known in this market by the large producers of Builders' Hardware toward reducing the official prices on cheap grades, in which competition is keen, but the trade is expecting some action in this direction. Skates, Sleds and Snow Shovels are beginning to move in the Northwest, where there has been cold weather and some snowfall. Trade in Shelf Hardware is good, but not extraordinary. Demand for Mechanics' Tools, both for wood and metal working, is improving, and Hardware business in general is being done on a basis that encourages producers, jobbers and retailers to believe that the books for 1904, when they are closed the last day of the year, will show an aggregate business equal to any previous year and better than 1903. The P. & F. Corbin Company has been awarded contracts for the Hardware in the Memphis Trust Company's building at Memphis, Tenn., aggregating about $8500, and the Thomas Orchestral building in Chicago, amounting to about $3000, the latter order being placed through Orr & Lockett Hardware Company, Chicago. Conditions in the Far West as far as Wire and Nails are concerned are practically unchanged.

NOTES ON PRICES.

Wire Nails.—Active demand includes liberal orders for shipment within 30 days from date of contract. No change has been made in official quotations, but there is a feeling, more or less general, that an advance will be made. Except at competitive points, especially in the West and South, where slight concessions, owing to the presence of competition, are made, the market is firm, with indications of a still firmer tone. Carload prices to either jobbers or retailers are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Carload lots	$1.60
Less than carload lots	1.65

New York.—A fair amount of business is being done, both in carloads and small lots from store. Dealers are reported as buying in a conservative manner and carrying light stocks. The market is firm at the following New York quotations: Single carloads, $1.79½; small lots from store, $1.85 to $1.90.

Chicago, by Telegraph.—The activity in the demand for Nails at this late season gives color to the report that considerable buying is being done by speculators outside of the regular market channels. Already there is talk of advancing prices, but the official schedule is still being maintained and at competitive points is still being shaded, though the strengthening tone of the market and the volume of orders already booked are reducing price cutting to a minimum. Carload prices to either jobbers or retailers are firm locally at $1.75, base, with less than car lots at $1.80 to $2, according to quantity. Makers still refuse to sell more than 30 days ahead at these prices.

Pittsburgh.—The mills are in receipt of liberal orders for Wire Nails for shipment within 30 days from date of contract. There is some talk of an advance in prices, but nothing official on this has been given out and it is mere guesswork. Prices, on the whole, are firm, but to some competitive points, notably in the West and South, slight concessions over the official price are being made. We quote Wire Nails in carloads to either jobbers or retailers at $1.60 and in less than carloads $1.65, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. off for cash in 10 days.

Cut Nails.—The Cut Nail Association expects to hold a meeting on October 27. An impression prevails that no change will be made in prices, but nothing official has been made known as to the probable results of the meeting. Demand is fair and, as a general thing, orders call for prompt shipment. While the association quotations represent the market in a general way, prices are sometimes shaded about 5 cents, or slightly more, to large buyers. Quotations are as follows: $1.60 and $1.65 for carload lots and less than carload lots, respectively, f.o.b. Pittsburgh. In the East Iron Nails are quoted at the same price as Steel Nails, but in territory west of Pittsburgh Iron Nails are quoted in carload lots, f.o.b. Pittsburgh, at $1.65, with an advance of 10 cents in less than carload lots.

New York.—Demand continues in about the same volume as for some time. Reports are to the effect that the market shows some weakness, also that some manufacturers are charging 5 cents per keg advance on prices which have been ruling. Neither of these reports is confirmed. The tone of the local market is firm. Quotations are as follows: Carloads on dock, $1.74; less than carloads on dock, $1.79; small lots from store, $1.85.

Chicago, by Telegraph.—A fair demand is maintained at from $1.75 to $1.80, Chicago, for car lots of Steel or Scrap Iron Nails, with a premium of about 10 cents for Puddled Iron. The demand for 3-penny to 4-penny Iron Shingling Nails seems to exceed the present supply.

Pittsburgh.—A fair volume of business in Cut Nails is being placed, but as a rule orders are for carloads and for prompt shipment. Consumers do not seem disposed to place contracts ahead. We quote Steel Cut Nails at $1.60 in carloads and $1.65 in less than carloads, f.o.b. Pittsburgh. For Puddled Iron Nails an advance of 5 to 10 cents a keg over Steel is asked. Our prices on Steel Cut Nails are sometimes shaded about 5 cents a keg.

Barb Wire.—The demand is good from the various sections of the country, but more liberal from the West and Southwest. The tone of the market is firm, and the feeling that prices may be advanced continues. The leading producer still restricts contracts to shipment within 30 days. Quotations as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Galv.
Jobbers, carload lots	$1.75	$2.05
Retailers, carload lots	1.80	2.10
Retailers, less than carload lots	1.90	2.20

Chicago, by Telegraph.—Favorable weather conditions throughout the West and Southwest and the prosperity of farmers generally are responsible for a liberal demand for Wire Fencing. The leading producer declines to name present prices for delivery more than 30 days ahead, and there is a strong undercurrent that may develop price advances before long. We quote: Jobbers, car lots, Painted Wire, $1.90; Galvanized, $2.20; retailers, car lots, Painted, $1.95; Galvanized, $2.25; less than car lots, Painted, $2.05; Galvanized, $2.35; Staples, $1.85; Galvanized Staples, $2.15. The jobbers' prices are named to large retailers by certain independent mills.

Pittsburgh.—Demand for Barb Wire is fairly active, the mills continuing the policy of entering orders only for shipment within 30 days from date. The tone of the market is firm, and there is some talk of an early advance in prices, but this does not come from an official source. Prices are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Galv.
Jobbers, carload lots	$1.75	$2.05
Retailers, carload lots	1.80	2.10
Retailers, less than carload lots	1.90	2.20

Smooth Fence Wire.—Business is on a large scale, stimulated to some extent, it is thought, by the possi-

bility of an advance in prices. Orders are confined to shipment within 30 days of date of contract. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads	$1.45
Retailers, carloads	1.50

The above prices are for base numbers 6 to 9. The other numbers of Plain and Galvanized Wire take the usual advances, as follows:

	6 to 9	10	11	12&12½	13	14	15	16
Annealed	Base.	$0.05	.10	.15	.25	.35	.45	.55
Galvanized	$0.30	.35	.40	.45	.55	.65	1.05	1.15

Chicago, by Telegraph.—Persistent rumors of higher prices in the not distant future are leading to an increased demand for Smooth Wire, but producers as a rule decline to book orders for delivery more than 30 days ahead. Prices on base sizes of Wire are unchanged at $1.60, Chicago, for Annealed, and $1.90 for Galvanized, in car lots to jobbers. The same prices are named to retailers in car lots by a number of makers.

Pittsburgh.—Demand continues quite active, the mills entering liberal orders and for shipment within 30 days from date of contract. Demand is particularly heavy from makers of Field Fencing, who have had an unusually active season. We quote as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads	$1.45
Retailers, carloads	1.50
Less than carloads	1.60

Sheet Zinc.—Under date of October 20 an advance is announced in the price of Sheet Zinc to $6.40 per 100 pounds in 600-pound casks, f.o.b. mill, subject to the usual discounts.

Rope.—There has been a falling off in demand as compared with last month, although business with manufacturers is fair. There is some irregularity in quotations, which accord with the individual views of manufacturers, but on the whole the market on Manila Rope is firm, while Sisal has a tendency to weakness. Quotations range, for 7-16 inch diameter and larger, from 11½ to 12 cents for pure Manila, while mixed grades are quoted at about 10¼ to 11 cents, according to quality. Pure Sisal Rope is quoted at about 8¾ to 9 cents and mixed Sisal from 7 to 7½ cents, according to quantity.

Window Glass.—According to reports, up to the last part of the week past 58 hand operating factories, with a total capacity of from 1300 to 1400 pots, have gone into blast. Some of these are working under one scale of wages, some under another, while others have agreed with workmen on private scales. This results in a somewhat confused situation and uncertainty about a uniform price for Glass. It is stated that present indications are that not over 1800 hand operating factories in the country will make Glass this fire. It is reported that as the result of a joint meeting of manufacturers and jobbers, held on the 25th inst., an agreement was signed to prevent the manufacturers selling direct to the consumers, and binding jobbers to buy only from manufacturers who will protect the trade in territory covered by jobbing houses. It is stated that about 75 per cent. of the jobbing concerns of the country were represented at the meeting, and that the agreement affects the majority of manufacturers not affiliated with the American Window Glass Company and the Pittsburgh Plate Glass Company. It is understood that a movement is under way to consolidate the leading Plate Glass plants.

Oils.—*Linseed Oil.*—While there is some car lot business, buying is largely confined to small lots. The market for State and Western Raw is stronger and 38 cents appears to the lowest figure for carloads. City Raw is steady at former prices. Quotations are as follows: State and Western Raw in carload lots, 38 cents; in five-barrel lots, 39 cents. City Raw, in lots of five barrels or more, 41 cents; in less than five barrels, 42 cents per gallon.

Spirits Turpentine.—In the local market demand has been light and prices have remained stationary. Orders have been small in Southern markets, buyers waiting lower prices, although the receipts of Turpentine are growing less, as operators have about exhausted the supply for the year, and the market should naturally show more strength. Quotations in this city, according to quantity, are as follows: Oil barrels, 55 to 55½ cents; machine made barrels, 55½ to 56 cents per gallon.

NORTH DAKOTA RETAIL HARDWARE ASSOCIATION.

IT has been decided to hold the next annual meeting of the North Dakota Retail Hardware Association on February 1, 2 and 3 next. The convention will be held in Fargo, this having been determined on at the last annual meeting. At the same time and place the Implement dealers will convene, it having been found desirable and enjoyable to have simultaneous meetings. The Hardware merchants have secured the Commercial Club rooms for their sessions, with headquarters at the Hotel Metropole. Arrangements are making to have addresses from some prominent Hardwaremen from other sections, and a very interesting meeting is confidently anticipated.

TRADE ITEMS.

EDWARD H. RICE, who completed 50 years' continuous service with the Walworth Mfg. Company, Boston, on the 19th inst., was the recipient on that date of a handsome loving cup and a magnificent clock from the directors of the company and his fellow employees as a mark of their appreciation and esteem. Mr. Rice entered the employ of the company at the age of 14, and now occupies an important position in their offices.

THE SEARLS MFG. COMPANY, Newark, N. J., manufacturer of Carriage and Sleigh Mountings, Bathroom and Household Specialties, has adopted as a registered trademark an outline figure of an artist's palette, with inscription S. M. Co. Hereafter this mark will appear on all Bathroom and Household Specialties of the company's manufacture.

D. T. HARRIS has resigned his position as general traveling sales manager for the Norvell-Shapleigh Hardware Company of St. Louis. Mail intended for him will reach him at 1428 St. Louis avenue, East St. Louis, Ill.

KRAUT & DOHNAL, Chicago, Ill., who have been for some years dealers in Cutlery, have incorporated with a capital of $25,000, their papers entitling them to manufacture as well as sell Cutlery. Emil Kraut, Ignaz Dohnal and Jesse Loewenhaupt are incorporators. Associated with this company is a manufacturing company known as the United States Cutlery Company.

A GOLD MEDAL has been awarded to the Boston & Lockport Block Company, Boston, Mass., for improvements in Tackle Blocks as shown at the Louisiana Purchase Exposition.

THE AMERICAN WIRE CLOTH COMPANY is making rapid progress in the construction of its mill at Clinton, Iowa, and expresses the belief that active manufacturing operations will begin early in December. The company, which is a new one backed by ample local capital, will enter the field of manufacturing and supplying Wire Screen Cloth.

F. E. MYERS & BRO., Ashland, Ohio, manufacturers of Pumps, Hay Tools, Barn Door Hangers, &c., have been awarded a grand prize and gold, silver and bronze medals and premiums at the Louisiana Purchase Exposition.

JAMES WATSON, of the Hardware firm of James Watson & Son, died at his home in Niagara Falls, N. Y., on the 22d inst. Mr. Watson was born in Huntley, Scotland, November 6, 1824. About 1844 he came to this country, and about 1852 moved from New York City to the former village of Suspension Bridge, now a part of the city of Niagara Falls, where he opened a Tinshop and Hardware store. Some years ago Mr. Watson took his son, George Allen Watson, in as a partner. Of late years he had been in failing health, and for the 30 weeks before his death was confined to his bed. Mr. Watson was a prosperous merchant and held in very high esteem in the community of which he was a conspicuous member for so many years.

Jobbers "Playing to the Gallery."

To the Editor: Brother Fernley's "Digest," as well as many articles and speeches from jobbers, have been apparently intended to curry favor with their customers, the retailers.

Want of Frankness

In conversation with some of the largest and best posted jobbers on the catalogue house situation, they have stated frankly that the catalogue house could be the most successfully and expeditiously checked by the waking up of the dead and sleeping Hardware dealers; yet publicly they seem afraid to express their convictions, lest they lose favor among their trade, and are apparently trying to use the manufacturer's paw to pull the chestnuts out of the fire.

By so doing they are not accomplishing one-quarter as much as if the same ink and energy were devoted to an educational campaign among the retailers. The jobbers' present methods only add fuel to the flame of the "deluded," who fancy the manufacturers can immediately drive the catalogue house "off the earth," as they will start a boycott, &c.; but as I stated in a former article, the catalogue house is here to say, is a legitimate competitor and must be reckoned with as such, and will certainly thrive when Hardware merchants (?) will allow advertisements of Lawn Mowers and Ice Cream Freezers to run in their local papers during midwinter, or Skates and Snow Shovels in July, as I have not seen once, but repeatedly, and how many Hardwaremen there are who run a general "ad." for months and sometimes years without changing, such as "John Jones Carries a Complete Line of Hardware, Stoves, &c." The local printer will repeatedly request a change of copy, but this merchant (?) is too busy sitting on a Nail keg "swapping stories" with the village loafers, or will say: "I can't write an 'ad.'" and this being a sample of his advertising, is he not an "easy mark" for the catalogue houses, for they can and do write copy that brings trade. It is their only trade getter, and the retailer can, if he will, write ads. that will bring him trade, and unless he gets out of the rut the catalogue house will get his trade, and he alone is to blame for it.

The Sluggish Retailer

A manufacturer recently sent a letter to 26,000 retail dealers inclosing therein a stamped, addressed return postal card, also a notice that if they desired the manufacturer would put them on his mailing list, send them a beautiful catalogue, and from time to time hangers that are works of art, circulars of new goods, &c., at no expense to the retailer, if interested, and over 20,000 on the list handle the goods made by this manufacturer, but buy through the jobbers. Only 5640 returned the cards signed. As it was an old, well-known and reliable manufacturer he was greatly surprised to find the retail Hardware dealers did not care to keep posted on the goods they were handling or be informed in regard to new goods in their line.

A Manufacturer's Surprise

The retail Hardware dealers, as a whole, are live, wide awake, up-to-date merchants, but it is the laggards, in whose territory the 5 or 10 per cent. of Hardware is sold by catalogue houses, who need shaking up—bringing to life, as it were—and taught to modernize their stores and methods. The trade papers everywhere are doing grand work in teaching the dealers present advertising methods and have accomplished much, for we are passing through the "Advertising age."

Modernizing Store and Methods

If the jobber would be one-half as zealous in his efforts to do the retailers good as he pretends he would stop "playing to the galleries," but start an educational campaign among the laggards, and instead of jollying them with articles in the trade papers, which in reality work an injury, would soon see the fruit of their efforts.

Jobbers' Jollying

The majority who complain most bitterly about the catalogue house driving them out of business are entitled to about as much sympathy as the retailer who complains of the Steel Range peddler selling two carloads of Steel Ranges in his territory at $69, when he, the retailer, sells a better one at $49. When he rushes into print and wants help and protection does he not make himself appear ridiculous? If he allows the Steel Range peddler to sell Stoves at $20 more than he can to his customers, and do it honorably, too, it shows that he stays in his store and whines instead of showing the trade he is as live and progressive as the peddler. If they cut prices it would be different, but they sell right under his nose at a 40 per cent. higher price.

A Ridiculous Situation

Let the wide awake retailers and jobbers spend their energy bracing up the indifferent ones and they can depend on the co-operation of the manufacturers. But when the jobber for effect lays all the trouble at the manufacturer's door, when he knows better, can the jobber expect eventually to get even sympathy, much less co-operation, from manufacturers?

ED. FORD.

Manufacturers' Co-operation

THE CONVENTIONS AT ATLANTIC CITY.

As previously announced, the evenings of Wednesday, Thursday and Friday, November 16, 17 and 18, will be devoted to entertainment features. On Wednesday evening the manufacturers will tender a reception at the St. Charles Hotel.

Card Party with Hardware Prizes.

On Thursday evening the ladies will give a progressive card party at the Hotel Rudolf, this event being in the hands of a committee under the leadership of Mrs. Geo. W. Trout of Chicago. A large number of prizes will be awarded. Manufacturers who desire to advertise their business by sending some article of their manufacture, to be awarded as one of the prizes, can send such articles to Mrs. Geo. W. Trout, care of Hotel Rudolf, Atlantic City. These prizes will be on exhibition at least one day before the card party. The ladies do not ask for any contribution from the standpoint of a gift, but have felt from a business point of view that manufacturers would be pleased to send something which they make.

The Banquet.

The National Hardware Association has deemed it wise to give its own banquet, rather than be entertained by the manufacturers. The subscription price will be $5 per cover. At previous conventions a number of gentlemen have been compelled to give up a large part of their time to the arrangement of details in connection with the banquet. The committee in charge this year earnestly requests that those who desire to attend send their name and check at the rate of $5 per cover to T. James Fernley, secretary, 505 Commerce street, Philadelphia, Pa., at once. This will enable the committee to know exactly how many to provide for and also arrange the seating of the guests in advance of the day of the dinner. The committee hopes that those who intend to be present at the banquet will be good enough to comply with this request.

Hotel Arrangements.

In order that there should be no dissatisfaction with the rates charged at the hotel, the Entertainment Committee of the National Hardware Association pre-empted the Hotel Rudolf, and the hotel management has assigned rooms to all who have thus far applied through the secretary's office. Inasmuch as there are other matters requiring his attention just previous to the convention, Secretary Fernley begs to announce that further requests for rooms should be made direct to the Hotel Rudolf. Cards giving the number and rate of the room will be issued in order that rates agreed upon shall be adhered to—namely, $3 and $4 per day on the American plan.

FACTORY COST AND BUSINESS METHODS.

THE CONTRACT SYSTEM IN MANUFACTURING.

THE contract system of manufacturing, while no longer in general use, is attracting anew attention among manufacturers, especially where the nature of the product makes piece work desirable. A generation ago this system was used quite extensively, but for one reason or another it was abandoned by most manufacturers, who, as a rule, replaced it by day labor. Now that piece work is coming more generally into use it is not improbable that the old system will gradually obtain some of its former popularity.

What the Contract System Is.

The contract system carries piece work one step farther by putting the shop contractor, who is paid by the piece, between the manufacturer and the workman, who in turn is employed on a piece work basis. It adds to the earning capacity of a given shop space, so it is claimed by its exponents, and to the production by tools and machinery, because the contractor, being an efficient shop manager, has every inducement to produce the maximum amount of work in order that his own income may be as large as possible. At the same time the manufacturer is rid of responsibility, and to a certain extent is saved from losses, because he pays only for completed work that passes the inspectors of his stockroom as being up to the required standard of excellence. This is the experience of a number of large establishments.

THE EXPERIENCE OF A LARGE MANUFACTURER.

The experience of one large manufacturer of Hardware, together with his adaptation of the system, is the subject of this article.

It is the theory of this company that where a workman is worth employing on certain classes of product piece work gives incentive to his labor. Otherwise he must be without ambition and snap. Under the contract system the workman's desire to earn as much money as possible is further stimulated by the contractor, who, being paid for every piece produced in his department, naturally desires that every man employed by him shall do his very best to turn out the maximum of perfect product. There can be no loafers on a contract job.

A GENERAL OUTLINE OF CONTRACT SYSTEM.

This company has no set form of contract. Individual circumstances govern each. But the general plan is the same throughout those departments of the works where the contract system is employed. It is not universal, for certain classes of work are better handled by the usual methods. The contractor receives from the company an agreed piece price for the labor on the work he is entrusted with. He is given full responsibility, and employs his own workmen. He is furnished with all the necessary materials. He is paid only for such of his product as passes the inspection of the stockroom as being up to the degree of perfection specified in the contract.

DEFECTIVE MATERIAL OR PRODUCT.

If the material furnished him is defective and his product is rejected as a result of such imperfections it is considered to be his own fault because he should have caused the material to be inspected, by himself, his foreman or his workmen, and should have rejected it, sending it back to the department from which it came to him. For instance, his work may have Brass Castings as its basis, and the foundry may send him imperfect Castings. He should discover the fact and send them back. It will be noted that the system gives the company an effective check on the various processes of its widely diversified product, one department watching the material furnished by another, actuated by the same personal motive that governs one manufacturer in buying material of another, and that is to procure for itself the greatest possible profit.

SELECTION OF CONTRACTORS.

As a matter of fact, the company regards its contractors as manufacturers, each responsible, to all intents and purposes, only to himself. The piece price is based on a desire to give the contractor an income equal to what a manufacturer, employing the same number of hands and doing the same class of work and working on a small capital, might expect to earn. He is selected with care, and after sufficient trial to test his capacity for management. He must be keen and alert, constantly on the watch for opportunity to improve methods of production and for indications of slackness among his employees.

ADVANTAGES ENJOYED BY CONTRACTORS.

Comparing the lot of the contractor with that of an independent manufacturer, he has an easy time of it. He has no worry about securing a market for his goods, no material to buy, and no bills to pay, excepting for his labor. In this particular establishment even his payroll is looked after by the company, as will be explained in more detail later on. The company assumes all these burdens. The contractor's energies are concentrated on the one responsibility of the actual production wrought by labor on his own particular line of work. He has a sure income in the known margin of difference between what he receives from the company for each piece produced and what he pays a workman for labor on that piece.

A GRADUAL DEVELOPMENT.

In this factory an individual contractor may employ as high as 150 hands. Others employ only a few. It depends upon the nature of the work to be done. The beginning of a contract job of considerable proportions may be in some new piece of work given to a good man to produce. As the demand for the article increases he needs another man and is told to secure such a man and the company will employ him. Later on he gets another helper under the same conditions. Finally, if he has shown capacity to warrant it, he is given a contract that may grow to a large business in itself. Usually a contract job is an evolution from some such small beginning.

WORKMEN PAID BY THE COMPANY.

Years ago this company paid the contractor in cash the full amount represented by the product of his department, and he paid his employees himself. This proved to be unsatisfactory both to the company and to the workmen, and doubtless to the contractors themselves. It was considered better that every employee in the works should be paid by the company, and this system has been in practice ever since. The contractor hires all his help and makes his own terms with each. The company guarantees the payment of the agreed price to the workman. Every workman employed by the contractor must register at the main office as well as with the contractor. Each week, three days before pay day, the contractor's books are submitted to the paymaster's department, and from the books the payroll is made up. The contractor receives the difference between the amount due him for the accepted product of his department and the amount of his payroll.

It will be noted that three days' pay of employees must necessarily be withheld in order to provide opportunity for the necessary clerical work of making up the payroll. The employees of the contractor are protected in respect to this money as well as to the rest of their wages, because the money due the contractor for these days is also withheld. As a matter of fact the contractor is usually more than the three days behind, because work for which his people have been paid has not reached the stockroom for acceptance, and consequently he has not been credited with it. It may be in his department in

uncompleted form, or his work may be such as to require work in another department before going to the stock-room.

Payment of wages by the company serves another purpose in affording the company full knowledge of the earnings of a contractor's employees, so that, if it were found that men or women working in the company's factory were being unfairly paid, steps could be taken to change conditions. Such instances do not arise, but were there no such check their possibility would exist.

LIABILITY FOR ACCIDENT.

Liability for accident to employees is another problem of the contract system. Where liability exists the contractor would probably be held liable, instead of the company. This is so in some States and probably in most. But in this establishment the company voluntarily assumes the responsibility and pays the damages where liability exists, and in cases where the workman is himself to blame for his injury, pays hospital or surgeon's expenses and the wages of the employee during his enforced absence from his work.

ANNUAL CONVENTION OF CARRIAGE BUILDERS.

THE thirty-second annual convention of the Carriage Builders' National Association was held at Milwaukee October 18 to 21, and proved to be one of the most successful conventions in the history of the organization. The exhibit of the accessory trades was given under the most favorable conditions, the Exposition building being used for the exhibits and affording ample space for all exhibitors. The attendance during the week aggregated fully 1000 members and representatives of the accessory trades.

The convention was opened Tuesday morning, October 18, with First Vice-President Frank A. Lancaster of Merrimac, Mass., in the chair, who announced that the duty of presiding over the sessions had devolved upon him owing to the death of the president of the association, Frank L. Wright of St. Louis. The address of welcome to the city was extended by Carroll G. Pearse, superintendent of schools, and was responded to on behalf of the association by Charles A. Carlisle of South Bend, Ind. Vice-President Lancaster then read the annual address and announced a Committee on Nominations.

New Officers.

The Committee on Nominations reported the following list of officers, all of whom were elected:

PRESIDENT, William W. Ogden, J. M. Quimby Company, Newark, N. J.

SECRETARY-TREASURER, Henry C. McLear, Wilmington, Del.

MEMBERS OF EXECUTIVE COMMITTEE: For three years—Charles A. Carlisle, J. B. Dort, A. G. Brunsman, N. Albert Hooker. For the unexpired term of two years of the late Frank L. Wright—W. H. McIntyre.

VICE-PRESIDENTS: C. A. Lancaster, Merrimac, Mass.; S. K. Page, New Haven, Conn.; H. A. Moyer, Syracuse, N. Y.; J. H. Mount, Red Bank, N. J.; H. F. Keachline, Philadelphia, Pa.; J. B. McFarlan, Connersville, Ind.; T. M. Sechler, Moline, Ill.; Morris Connolly, Dubuque, Iowa; Jas. W. Moon, St. Louis, Mo.; Arthur P. Karbach, Omaha, Neb.; Theo. Luth, Cincinnati, Ohio; H. A. Muckle, St. Paul, Minn.; Chas. Bosher, Richmond, Va.; W. T. Jones, Carthage, N. C.; W. B. Smith, Barnesville, Ga.; E. M. Brannick, Portland, Ore.; J. P. Beck, Saginaw, Mich.; G. W. Ogden, Milwaukee, Wis.; John E. Hayford, Newton, N. H.; F. C. Nuetzel, Louisville, Ky.

The Carriage Building Industry.

On Wednesday the report of the Executive Committee was presented by its chairman, Daniel T. Wilson of New York, which showed that the Carriage building industry now has 7600 establishments, employing 65,000 operatives, who receive $34,000,000 annual wages and produce 1,600,000 vehicles, valued at $120,000,000. The report stated that while this had not been a favorable year for the business, there had been a decided improvement during the past few months, and referred to the very material increase that characterized the export trade during July, August and September.

Secretary's Report.

Secretary McLear's report showed a healthy financial condition, with cash on hand January 1 of $5473.57. President Ogden, as chairman of the Board of Trustees of the Technical School for Carriage Draftsmen and Mechanics, reported that the school continued to be well attended and was accomplishing valuable results for the trade.

Constitution Amendments.

On Thursday amendments to the constitution were made as recommended by the Executive Committee, one of them being the substitution of "vehicle manufacturers" for "carriage manufacturers" in the article relating to membership, thus covering Automobiles, Wagons, Carriages and allied industries accessory to the business.

Decreasing Timber Supply.

A feature of the convention was an address by M. T. Richardson of New York on "Success in Business." In the report of the Committee on Reciprocity considerable attention was given to the subject of the decreasing supply of Carriage timber and the necessity of taking steps to preserve the forests. A committee was appointed to secure the co-operation of the Department of Forestry at Washington in protecting the forests from which Carriage builders derive their special kinds of timber.

An elaborate banquet at the Plankinton House on Thursday evening, at which 515 men were present, was the leading social event of the convention. The same evening the visiting ladies were given a banquet at the Hotel Pfister.

Philadelphia was chosen as the place of the next convention.

DEATH OF GILBERT H. ACKERMAN.

GILBERT H. ACKERMAN, for many years identified with the Hardware business in Albany, N. Y., died in that city on the 18th inst. from the effects of an operation. Mr. Ackerman was born in Albany 72 years ago and at an early age entered the employ of the old Hardware firm of Davidson & Viele. Later he formed a partnership with Erastus Corning and Bradford R. Woods in the manufacture of cotton gins. Retiring from this business he embarked in the Hardware line for himself in 1871. After many years he disposed of his stock and then entered the employ of the Albany Hardware & Iron Company, with which corporation he continued identified until his death.

ASSORTMENT OF TOOLS BEARING SPECIAL BRAND.

A PROMINENT jobbing house is offering Hardware merchants an assortment of mechanics' tools bearing one of its well-known special brands. The line consists of Hatchets, Hammers, Saws, Screw Drivers, Cold Chisels, Squares, Saw Sets, Files, Carpenters' Pincers, Chisels, Auger Bits, Nail Sets, Tape Lines, Saw Clamps, &c. This assortment is being offered to only one house in the town, to whom the exclusive sale is given. In marketing these goods the argument is made that the dealer handling them will not be troubled by competition from catalogue houses, department stores, or home competition. All the articles are fully warranted, the line being sold at a good rather than a low price, with the expectation that the retail prices of the tools will yield a good profit, and that the dealer will take special pains to push the line. Quantities range from one-sixth of a dozen Ball Pein Hammers to one-half dozen of Bits, Chisels, &c. The point is further made that any quantities, large or small, can be obtained for replenishing the stock.

THE HOPKINS & ALLEN ARMS COMPANY, Norwich, Conn., is marketing a new Automatic Revolver, which has many of the features of the original H. & A. Revolver, It is medium priced and will, it is expected, prove a good seller.

Geo. H. Biegert has succeeded Woodbine Hardware & Furniture Company in Woodbine, Kan.

TRADE WINNING METHODS.

This department is for the description of approved methods of carrying on and extending business, and a cordial invitation is given to merchants to co-operate in the effort to make it suggestive and of practical use to the trade.

PRACTICAL HINTS CONCERNING HARDWARE STORE ADVERTISING } V.

BY GEORGE J. BASSETT.

Advertising Booklets.

ALTHOUGH the newspapers, generally speaking, are the best mediums for retail store advertising, there are other ways of advertising which should not be overlooked altogether, but which are of particular benefit at particular times. Advertising in cook books, programmes, premium lists and such may be condemned as a whole, and yet individual cases to the contrary may often be cited.

In my own business I have found booklets a profitable supplement to newspaper advertising. They will oftentimes reach people who never read your ad. in the papers, and there is greater chance in a booklet to go into details or touch on more lines of goods than in a newspaper. But I don't mean by this that a booklet should be prosy and long winded. "Brevity is the soul of wit" in booklet as well as in newspaper advertising.

It Should Be Artistic.

A booklet, moreover, gives you a chance for artistic effects and should always be artistic in every sense of the term. It should be printed by the best printer you know of, it should be of good paper and should, above all things, have an attractive cover, for the outside appearance is what keeps it longest from the waste basket.

THOSE THINGS
WE KNOW ABOUT
BEING an EXPOSITION of sundry well-known FACTS, both old and new, and now collected and written down for the ENLIGHTENMENT of the YOUNG and the EDIFICATION of the OLD
By THE JOHN E. BASSETT & CO.
Ye Olde Harde-Ware Store
NEW HAVEN 1899

Illustrations are not absolutely necessary, but good illustrations will add much to the effectiveness of any advertisement. You notice this in turning over the advertising pages of a magazine—the illustrated ones are the first to catch the eye. But illustrations, if used at all, must be good and pertinent to the text.

Booklets Are Especially Helpful

at the beginning of spring or fall for advertising seasonable goods, and also just before the holidays for Christmas things. A page with some appropriate heading should be devoted to each subject, and a few prices may be quoted on leading articles or specials.

A Mailing List.

Make up your mailing list from such sources as are most available. In cities the telephone directory gives a list of the best people in each town—from a business standpoint.

Don't mail your booklet in a cheap envelope or use a one-cent stamp. It's strange what a difference to the waste basket the color of a postage stamp means. A two-cent stamp seems to carry with it some sense of value, but a penny stamp has a cheap look, which shows the lack of respect our Government has for the picture of a good man like B. Franklin when he's dead.

A WINDOW CRASH.

THE unique window display reproduced herewith was recently gotten up by Seavey Hardware Company, Fort Wayne, Ind. The illusion proved to be quite an attraction, and occasioned considerable merriment on the part of the public. In addition to the firm's regular adjustable figure or stock dummy the make up consisted of a dilapidated Wheelbarrow, a Mattock and a keg of 20-penny Nails. To produce the effect that the window plate had been broken by the collapse of the Barrow and the precipitate overturning of the keg and its demolishing contents, very pale green Paint was used to imitate the window cracks, while a Roofing Cap glued to the immediate point of the supposed crash hightened the illusion.

A Window Crash.

MAILING LIST OF A SOUTHERN HOUSE.

LUTTRELL HARDWARE COMPANY, Brewton, Ala., wholesale and retail Hardware, Agricultural Implements, Paints, &c., has recently distributed by mail over territory embraced in a radius of about 75 miles of its town a budget of printed matter calling attention to different lines which it handles. It has a mailing list of over 3000 names, which it watches closely so as to keep it alive and up to date. This list was started by names secured through the medium of letters sent to one individual, generally the postmaster, at every post office in the company's territory. These letters solicited the names of farmers, mechanics, blacksmiths, &c., getting mail at their respective post offices. The company has found that generally the best results are obtained by inquiring of postmasters, especially the fourth-class postmasters in the small country offices, who are nearly always willing on a personal request to furnish names of people who get mail at their offices. The imposing list of names thus secured has been supplemented from time to time through the store and through its representatives in their travels over the country.

CHARLES F. SCHMIDT, president of the C. F. Schmidt Hardware Company, Burlington, Iowa, died on the 22d inst. The immediate cause of death was dropsy. Mr. Schmidt was 71 years old and had enjoyed good health until last spring. Mr. Schmidt had been engaged in the wholesale Hardware business on his own account since 1877, prior to which time he had acted as traveling salesman for Nelson & Co. of Burlington. Mr. Schmidt was held in very high esteem for his personal qualities and his death is sincerely mourned by a large circle of friends.

PRICE-LISTS, CIRCULARS, &c.

Manufacturers in Hardware and related lines are requested to send us duplicate copies of catalogues, price-lists &c., one copy for our Catalogue Department in New York and another for our London office; and at the same time to call our attention to any new goods or additions to their lines, of which appropriate mention will be made, besides the brief reference to the catalogue or price-list in this column.

C. E. JENNINGS & Co., 42 Murray street, New York: Tool Chest catalogue illustrating lines of boys', men's and planters' Chests complete with tools; Tool Cabinets, Electricians' and Carpenters' Shoulder Tool Chests, Empty Tool Chests, Machinists' and Jewelers' Chests, Metal Corners for Tool Chests, Hard Wood Miter Boxes, &c.

PRATT & WHITNEY COMPANY, Hartford, Conn.: Discount Sheet applying to the company's Small Tool catalogue No. 21 in effect October 1.

NICHOLS BROS., Greenfield, Mass.: Illustrated catalogue relating to a large variety of Knives, Cleavers, Beef Splitters, Butcher Saw Blades in coils, Tryers, Scrapers, &c. The firm also forge special shapes to order.

HOPKINS & ALLEN ARMS COMPANY, Norwich, Conn.: Spanish catalogue of 42 pages. It is 3¼ x 6 inches in size, so that it can be conveniently mailed in an ordinary business envelope.

GLEN MFG. COMPANY, Ellwood City, Pa.: Illustrated circulars relating to Fences for lawns, schools, churches, cemeteries, public buildings, farms, &c.; Steel Folding Mats, Tree Guards, Hitching Posts, Fence Posts, Window Guards, &c.

CRESCENT HANDLE WORKS, Evansville, Ind.: Circular illustrating with list prices D Handles, Crescent Cross Cut Saw Handles, Hay Fork, Rake and Hoe Handles; Long Bent Handles, Planters' Hoe Handles, Crescent Cant Hooks and Timber Carriers. The company is also in a position to make choice Handles of any kind to order.

THE WINSTED EDGE TOOL WORKS, Winsted, Conn.: Illustrated catalogue devoted to Chisels, Gauges and Drawing Knives. Among the goods shown which are new to the company are Socket Firmer Chisels with leather tipped handles Razor Blade Pattern Drawing Knives with special fancy finish, Handled Butt Chisels, Socket Pocket Chisels in boxes, Combination Tool Sets in boxes and a variety of Chisel Sets in fancy boxes.

SIDNEY SHEPARD & Co., Buffalo, N. Y.: Illustrated pamphlet of Kitchen Specialties, showing Improved Perfection Tins, Savory Roasters, Sifters, Graters, Poachers, Cereal Cookers, Double Quick Boilers, Combination Dippers, Egg Whips, Aluminum Tourist Cups, &c.

HARTWELL BROTHERS, Chicago Heights, Ill.: Price-list of Hickory Handles adopted September 10.

IVORY HANDLE COMPANY, Hope, Ark.: Price-list of Hickory Handles, including Axe, Pick, Sledge Tool, Maul, Hammer and Hatchet Handles.

THE CLEVELAND STONE COMPANY, Cleveland, Ohio: Pamphlet entitled "Grounds for a Good Grindstone," in which they emphasize the importance of quality in Grindstones and the necessity for careful and intelligent selection if the best results from their use are to be secured.

KELLER & TAMM MFG. COMPANY, St. Louis, Mo.: Price-list of Hickory Handles adopted September 10 by the Hickory Handle Manufacturers' Association.

BUTLER BROTHERS New York: "Our Drummer," of nearly 500 pages, with prices to merchants only on an immense line of general merchandise, going into effect October 24 and good during November or until their December catalogue is issued.

THE T. E. JACKSON WOODENWARE COMPANY, Atchison, Kan.: Revised price-list of Hickory Handles, which went into effect September 10.

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Letters from Merchants About Going Out for Business.

Canvasser on the Road All the Time.

From a Wisconsin Merchant: I do not know of many Wisconsin dealers who have adopted soliciting as a means of securing trade. One, however, has put a low priced man out on the road within 10 or 15 miles of his store, who spends all of his time from Monday morning until Saturday night visiting with the farmers, thus finding out who is going to paint, and when, hearing of complaints against his employer (which might otherwise be quietly nursed and allowed to fester), ascertaining who is talking of buying a new Stove, and making himself solid with the "kids" and thus securing the good graces of the feminine part of the household. All this is done at a small expense, the solicitor often paying for his "keep" with a Nickel Tea Pot or Dish Pan, "which he happened to have in his rig." This merchant has told me that the plan pays him abundantly. It certainly ought to result in good, and I can see no objection to it.

Will Stay at Home.

From a Merchant in Washington: Up to about eight years ago we went after business, but as every one else was doing the same here we all got together and cut out this expense item. It might help to stand off the catalogue competition, but we have no idea of going back to it. To meet catalogue house prices would mean a general cut in profits and we are afraid it would lead to a nice little ad. for the catalogue house. No, in our judgment, we will stay at home, especially as we are convinced that the catalogue house is here to stay.

Canvassing Is Worth While.

From a Hardware House in New York State: We send out our best clerk occasionally to canvass for trade, and I go out myself some. It all helps more or less, for whether we make sales or not, it keeps the store before the public.

Keeps Store Before Public

We went after the installment house agents this spring. They were selling Wringers, Washing Machines, &c. We had a special folder made up, and our clerk distributed these and made a house to house canvass besides. We made some sales in this way that otherwise would not have been secured. I think, on the whole, it is worth while to canvass for trade.

Judicious Canvassing Brings Good Results.

From an Ohio Firm: I always think it good business policy to take any reasonably aggressive action to secure new business, or to retain what is already secured, and canvassing the retail customer in a judicious way will bring good results. Every retail merchant has some line of goods that is usually sold through a house to house canvass. With some it is a line of Buggies, others it may be Cream Separators or Harvesting Implements, and I would suggest that a canvass be made at regular intervals with a line of this kind as a specialty, and the canvasser at the same time can solicit business for other articles kept in the store, and be very diligent in getting information as to what the customer is likely to need in the future, making a list which the house will continually have before them, and use the "follow up" system to close the deals. To-day a merchant must not only be thoroughly informed as to his own business, but must, to a reasonable extent, know that of his competitors, and I know of no better way than as above indicated.

Special Lines

Canvassing Desirable.

From an Illinois Merchant: As to the desirability of retail merchants canvassing their trade personally, or by representative, with a view to working up business, the plan seems to me entirely feasible and altogether desirable, although I have personally never made such an effort. However, an attempt in that direction has recently come to my notice, although I cannot say with what success.

It seems that the employees of a certain small department store were instructed to call up their friends and acquaintances by telephone and urge them to give their trade to the store for one month in order that they might see for themselves what good values and service the store was giving its patrons. It may be that letters were sent out to some, and the trade of others personally solicited—as to that I cannot say—but it certainly should have been done to make the campaign cover the entire field. This concern has about ten salesmen. If each employee solicited the trade of 200 people for 30 days, and 5 per cent. only should have responded, it ought to have made a banner month's business, and may have gained 100 permanent customers for the house. It certainly did not drive away any trade, and should have materially increased it.

A Novel Bid for Trade

I have no doubt a personal canvass would show big results in any business. Customers like to know a firm values their trade enough to make a personal effort to get it. It is a subtle piece of flattery that pegs them up a notch or two in their own estimation, and vastly increases their respect for the enterprise of the firm asking their patronage.

Flattering Customers

Imitation typewritten letters might be sent out with good effect at stated intervals, describing new and seasonable goods, special bargains, &c., for consideration. This might be varied by an occasional postal card giving a single item or a short list of bargains. On the farm postal cards are not thrown away unread.

A monthly store paper may be made tremendously effective as a trade winner if well conducted. It can be made an attractive and welcome guest at small cost, and would probably do more than anything else to help the merchant meet catalogue house competition. But the merchant issuing it ought to be wide awake enough to study the catalogues as they come out and advertise the same goods at similar prices, offering in the same issues seasonable goods and novelties bearing a handsome profit. Some profits would have to be sacrificed. Some goods might have to be sold at a slight loss, but compensation would undoubtedly come in the increased volume of trade, to say nothing of the prestige gained by the store.

Monthly Store Paper

This should be supplemented by newspaper advertising. No good merchant can afford to neglect this method of publicity. It always pays if rightly used. The retailer who does all these—and sells for cash, or gets close to a cash basis—need have but little fear of catalogue house competition.

Extra Expense and No Advantage.

From a Nebraska House: In regard to Hardware solicitors, I do not think that it would be any special advantage, and it would be an extra expense. It is necessary to send out machine solicitors, but for the Shelf Hardware line it would not pay the country dealer. The farmers get most horridly tired of us, even for that part of the soliciting that seems absolutely necessary.

I find a good way to reach the trade is to print small handbills, making prices on such goods as farmers are in the habit of sending off for, and mail them on the R. F. D. routes, also placing one in each package of goods sent out of store.

Personal Letters and Visits.

From an Arkansas Merchant: The best suggestion I can make is for every dealer to get down to his knittling and hustle, and be original in his method. We are not bothered to any great extent with catalogue house competition. But I attribute this fact to the work I have done in the past, and which I am preparing to carry on more aggressively in the future. I write a personal letter to all heads of families on rural routes every month, or else I visit them either in person or by trusted employees, and try to impress on their minds that they can send their orders to me and I will fill them at once, and deliver right to their door. If I cannot get the mail carrier to deliver the goods I try to catch a farmer's wagon going near, and send the goods out, and if I cannot deliver any other way I send my own wagon out and finish up the trip with missionary work.

Minimizing Catalogue Competition

An Occasional Canvass

From a Merchant in Washington: We think it very necessary to go after trade occasionally, though having a man specially for that purpose would not pay.

Would Hardly Pay Except in Certain Cases.

From a Colorado Merchant: In this locality I do not think it would justify me to canvass the country for trade, except in certain cases. When I learn of improvements to be made I solicit the business. If the party does not come to me I go to him. I think it best to solicit a prospective sale.

I think it would encourage cutting prices to keep a man on the road canvassing the trade. I tell my customers that I will meet prices of the catalogue houses, freight added, on any article in my line, but it must be a cash deal. I am satisfied we would get a great deal of this catalogue house trade if we would guarantee prices. In some deals our profits would be small, but we would have a good margin between the express they would pay and the freight we would pay. Merchants would find that it would be but a short time before the catalogue houses would not be referred to by their customers.

Guaranteeing Prices

JOBBERS' SPECIAL BRANDS.

We give below further extracts from letters from both manufacturers and merchants in which the question of special brands is discussed in various aspects.

What Manufacturers Say About Special Brands.

Manufacturers Have Fostered the Special Brand Evil.

From a Manufacturer of Cutlery: The practice of putting special brands on their products by manufacturers has become so general that I hardly think it possible for them to stop it even if they were so disposed. The fault lies largely with the manufacturers, who, in their eager desire to procure business and meet competition, have fostered this evil by agreeing to put the customer's name, or brand, on the goods.

Discussion May Help

We believe a free discussion of this subject by the American Hardware Manufacturers' Association may obviate the evil to some extent, but the practice can never be wiped out. Jobbing houses who take pride in their reputation in the market are very solicitous about the quality and finish of the goods under their own brand, and are not buying second or third quality goods, but are placing their business with manufacturers in whom they have the utmost confidence.

This is a large subject and much can be said on both sides of the question. As said before, we believe that manufacturers would be better off to-day if they had never consented to put special brands on their product.

Uniformly Refuse to Put Up Special Brand Goods.

From Manufacturers of Enameled Ware: We are firmly opposed to making special brands or putting out goods under customers' special labels. We do not consider that a jobber's brand carries the same weight that the manufacturer's trade-mark or label does, and any legitimate or standard line of goods for the manufacturer's protection should carry his own trade-mark, and thus become known to the consumer as an article of merit.

For the Maker's Protection

We often have requests from the jobbers to supply them with a line under their own label, but we uniformly refuse to do this. We estimate that it would complicate matters for us and in some respects increase the cost of production to attempt to do business in this way.

Special Brands a Serious Evil.

From a Manufacturer of Builders' Hardware: In a general way we believe that it is detrimental to the interests of a manufacturer producing first-class goods to let his identity disappear by the substitution of labels bearing other numbers or names than those regularly used. A reputation that has taken a manufacturer years of hard work to establish could be wiped out very quickly by the general use special brands. We fully agree with you that it is a serious evil, and our policy now is, and always has been, to maintain the reputation which we have established by insisting that our products must go into market under our own name, class numbers and labels. The more requests we have to use special labels, the more we feel the importance of keeping our own name, numbers and trade-marks before the consumers.

Blasting Reputation

Profit and Good Will Sacrificed Through Special Brands.

From a Manufacturer of Cutlery: In the line of Manufacture in which we are directly interested the demand for special brands has grown to such an extent that in certain portions of the country every merchant who calls himself a jobber has special brands upon which he is bending his greatest energies, and which he is pushing, as far as is practicable, to the exclusion of the various factory brands. As a result the good will of the manufacturer who is supplying this demand for specials brands consists of the kindly feeling that his various jobbing customers have toward the factory that is making for them privately branded goods of satisfactory quality and that afford a profit, and unless there is something individual about the manufacturer's line which distinguishes it from competitive lines his business is in jeopardy at all times, as the jobber can transfer the account at will. I deem it fair to say at this time, however, that with one or two exceptions it has been the policy of the various jobbers to be loyal to the factory from whom they have been purchasing as long as the conditions warranted it.

Exterminating Factory Brands

Aside from the loss of good will that should accrue to the producer there is a serious inroad made into the estimated profit account in the making of special brands. In many cases, especially among the smaller jobbers, it is not feasible for them to place orders for the various numbers and sizes in anything like the quantities that the manufacturer runs through under his own brand, and upon which his costs are figured. In addition, often rush orders will be received for, say, a few dozens of one number and size of knife, which, I grant you, is probably all the jobber needs at just that time, but which must be rushed through the factory at a largely increased cost on account of the size of the order. And the above, together with the fact that the cost of etching plates, special labels, special boxes, &c., have always been borne by the manufacturer, makes the cost of special brand goods figure, in many cases, in excess of the cost of the factory brand.

The Matter of Costs

In our judgment, therefore, the two serious evils resulting from special brands are loss of good will with the consumer and loss of profit, for the reasons given above. The loss of good will can be overcome in a measure by putting into the field a force of men who will solicit the trade of the retail hardware merchant under the factory brand, and in our judgment this is something that the jobber has no right to object to as long as the proper differential is maintained between the price to the jobber and the price to the retailer. This policy pursued conservatively will establish a good will for the manufacturer's brand that will in a measure offset his loss of good will by the jobber's brands and will make his line attractive enough eventually so that the demand for the factory brand will gradually increase. The matter of extra cost in manufacturing, &c., we presume will have to be borne in the future as in the past, smilingly; for, in our judgment, private brands have come to stay and will be sold just as long as hardware is sold.

Soliciting the Retail Merchant

Special Brands an Evil.

From an Ohio Manufacturer: Special brands are an evil, as they are used for fraud oftener than to enable purchasers to choose that which is best suited to special needs and purposes.

If special brands were used only to designate grades or quality there would be no objection to them, perhaps, but in most cases they are used to enable manufacturers to dispose of inferior goods.

An Injurious Practice for Established Manufacturers

From a Manufacturer of Hardware Specialties: We have wholly refrained from selling our goods under special brands. Indeed, we have not sold any goods under special brands for a number of years. In our opinion the reputation of a first-class manufacturer is worth more in marketing the goods than the special brand of some distributing house. The manufacturer has more at stake with reference to the goods than the distributing agents, and the wider publicity that it is possible to give his own markings we think is in itself worth a great deal to the manufacturer. Also it has been our experience that specially branded goods for some reason usually seem to be rather a second rate product, and we think by a large part of the trade are looked upon with some slight suspicion on that account. We think dealers and consumers like to know who are making and standing behind the goods they are using. In short, we think the practice of specially branding goods for customers is an injurious one for the manufacturer of first-class articles, and in the long run a detriment rather than a benefit for the house handling them.

Special Brands Suspicious

Going from One Factory to Another.

From an Ohio Manufacturer: We do not believe that manufacturers take the same pains with special brands that they do with their own brands, for the reason that the jobber may have one factory make his goods one year, and another factory make them next year, and while they may be told the goods will be the same, or just as good, yet they have not the advantage of knowing whether such is the case or not. Manufacturers advertise their goods in the trade papers under their own special brands. Jobbers do not advertise in trade papers. Practically the only advertising they do is in their catalogues and through their

traveling men. When we buy goods we want to know who makes them, and imagine the retailer and consumers want to know who makes the goods they purchase as an earnest of their quality.

Depends Upon Size of Orders.

From Manufacturers of Silver Plated Ware: We do considerable in the way of special brands. Some of it is all right and some of it is a nuisance. It all depends upon the size of the orders.

If a man gives us an order of sufficient size we had just as soon put his brand on it as any other. If a man wants us to make stuff for him with his brand on, however, and gives us a small order, it is not only an expense, but a nuisance. We generally get an additional price for special brand goods, which helps even matters up.

Will Not Trust Any One to Sell Their Goods Under Another Name.

From a Well-Known Manufacturer: There are a great many thing to be said against special brands, and we fail to see that any of them can be disputed. The chief argument against them in our opinion is the fact that the merchant gets out a special brand of high quality and as soon after as is possible replaces it with a brand lower in quality, making the second article live upon the reputation of the first. This form of substitution is carried on by nearly every merchant who handles special brands.

We have never put out our goods in this way, because we know that as soon as they are marketed in satisfactory quantities the request for goods would drop off and the sellers would substitute some one of the numerous imitations which would save them money. We are not willing to trust any one to sell our goods under any name but our own. Moreover, no matter what the previous reputation of the house, we find that with but few exceptions they have already substituted the imitation for our goods, and that it is only by continual hammering that we hold our sales in any teritory where the imitation article has been shown up at a list price.

Substituting Imitations

If business honesty were at its old stand and considered more valuable than gross sales, we should have no trouble. Special brands are an abuse which should be worked away from in every case possible. There is no reason why the manufacturer of the article should not get credit for his labor, the use of his name and the amount of capital and risk which he runs in its manufacture.

Commercial Suicide.

From a Manufacturer of Mechanics' Tools: The manufacturer of first-class high grade goods, with a well established reputation, who makes the same quality under a special brand for a particular jobber, in our opinion is committing commercial suicide. The manufacturer, however, who makes the cheapest goods has nothing to lose, and something to gain, by making his goods under special brands, as his customer, having gotten tired of the first brand, may be hoaxed into buying the same tools under another brand; in other words, being fooled twice.

We would under no circumstances make our goods under special brands for anybody, even in the largest quantities.

Emphatically Opposed.

From a Manufacturer of Files: We are emphatically opposed to special brands, and we trust that you will use your influence to lessen the evil.

A Great Annoyance.

From a Well-Known Manufacturer in New York State: We do very little in special brands in connection with our manufactures. In general we consider them a great annoyance to the factory, and have seldom seen them produce any permanent business for the jobber. The jobber who permanently uses private brands will in the end furnish cheaper goods. Manufacturers will slight the goods as compared with their own brands, on which they make money and for which they obtain a better price.

What Merchants Say About Special Brands

From a Firm in Massachusetts: We are not in favor of special brands on our best goods. We believe that a special brand is nearly always a cover for an inferior grade of goods. When a jobber offers a special brand he always offers a special price, which is evidence of the fact that the goods are not standard. When a manufacturer has spent years to put a first class article on the market let us perpetuate his name by always insisting on having it on our best goods.

From a Rhode Island House: We sell only goods bearing maker's name for best. If I was the customer I would not buy anything of value and importance that did not have maker's name on it. Special brands are adopted, as are some discounts juggled, to hoodwink the trade and consumer. It is always harder to sell a thing under a special brand than one under the maker's name. Everybody knows that if more money could not be made on special brands they would not be handled.

From a Wisconsin Merchant: It has been my experience that tools bearing the manufacturer's name find the most ready sale, for these reasons: The manufacturers have entered the ranks of the advertisers and are familiarizing the public with the merits of their goods. This creates a demand and makes them easier to sell than the same goods bearing a jobber's unknown brand. The manufacturer's name on an article of merit creates a feeling of confidence in the mind of the buyer. He is familiar with the name, knows that the goods are satisfactory, and to offer him the same article under a jobber's brand makes him suspicious.

From a Pennsylvania Merchant: We are very much opposed to having a special brand on any tools we sell; it always causes suspicion as to quality.

From a House in Massachusetts: We invariably use goods bearing the manufacturer's name.

From an Ohio Merchant: While we appreciate the position and value of the legitimate jobber to the retail trade, we believe this one feature of their business is very objectionable. We do not have our own name placed on many lines of goods in our store, as we prefer to talk the makes of standard manufacturers and rely upon their reputation, endeavoring always to make our store headquarters for the best makes of everything. We never buy a jobber's brand, although we do a good part of our purchasing through jobbing houses.

From a House in New York State: Goods bearing manufacturer's name every time.

From a House in Maine: We do not believe in private brands, as they are usually put on second quality goods. We always prefer manufacturers' names on the goods, as we think they are better known than we are, so when any one offers us special brands we think there are some reasons why they do not put their own name on, so expect to buy them less than regular goods.

From a House in Massachusetts: It is very seldom we handle a jobber's special brand of goods. We prefers to handle goods of the regular manufacturer's brand. Sometimes we have our own brand.

From an Ohio House: We most decidedly prefer to have the manufacturer's name on our best lines of goods, as we feel that it insures us the best material.

From a Firm in Connecticut: We always avoid handling jobbers' special brands, as we have more confidence in the goods put up by manufacturers under their own name.

From a Virginia Merchant: We handle principally manufacturers' own brands, especially where they are well known, but handle a few jobbers' brands.

From an Indiana House: We prefer to sell goods either under manufacturer's brand or with our own name on same.

From a Merchant in Massachusetts: It would seem very strange to us to sell certain well known Tools under any other name but their own. There might be cases where it would be of an advantage to jobbers to have certain goods under special brands, so that for a time they could control the sale of such goods, but in almost all cases we think that jobbers' special brands have been put on goods of inferior quality. "You can fool some of the people some of the time, but not all of the people all of the time." Merchants generally are pretty well posted as to who manufacture the best goods.

From an Ohio House: We sell a number of Tools under jobber's special brand, but find that the better grades sell more easily, and with more satisfaction to ourselves, under the manufacturer's own brand.

From a Merchant in Pennsylvania: We want manufacturers' brands. Jobbers' brands do not amount to anything. They may take the output of a factory and run the risk of a warrant on inferior goods, and next year have another maker go down 10 per cent. in price and put same brand on goods, still risking a warrant. We are of the opinion that

the best goods have the manufacturer's name on them, and they very often put out their seconds under another brand. For best goods give us manufacturers' brands, and we know who to look to for redress.

From Maine Merchants: We avoid special jobbers' brands always, and stick to the manufacturer's brand every time.

From a New York State Merchant: I prefer to get manufacturers' brands, and do in almost every instance. I have even gone so far as to refuse to buy goods of firms that have a great many goods with their own brand. These special brands would not mix in with the broken stock of regular brands that had come with the makers' regular brands and numbers.

From a Massachusetts House: We believe it is better for the dealer to use the manufacturers' brands, and we certainly believe it is for the interest of the manufacturer to do so. If both jobber and manufacturer, when putting on the market special brands of goods, would do business in a straightforward manner regarding quality, &c., that would be one thing; but, in our experience, there is a desire and inclination to reduce the quality of goods in one way or another, and, by having a special brand, there is an opportunity to fool some one. We know of many cases where this has been done.

Special Brands in the Long Run Do Not Pay.

From a House in New York State: I have made a very careful study of this subject for a number of years and have never believed it to be to my interest in the long run to handle special or my own brands of goods. I believe it to be to the best interest of the merchant to handle standard, reputable and reliable brands of goods of a well-known quality. The average buyer of Hardware at the present time is so well informed that he will at once recognize standard brands of goods, and also as readily recognize special or bogus brands. Therefore the merchant that offers his customers standard goods has a prestige, as in so doing he establishes for himself a reputation that would be impossible to establish or maintain on an unknown brand.

No Risk in Factory Brands

Further, the manufacturer of an article is looking constantly to keep the quality of his best grade up to the standard, but special brands of goods do not receive this attention. The merchant has no means of detecting any variations in quality until the finished product has gone into the hands of his customer and into actual use. Therefore the merchant runs a great risk of losing his own reputation in the marketing of these goods, while there would be no such risk on the part of the dealer if he were handling exclusively manufacturers' high grade brands. The manufacturers are constantly testing every particle of material and a sufficient quantity of each batch or finish as the goods go through their works to see if they are positively up to the standard.

Brands that Are Known

The manufacturer of a standard article advertises his products thoroughly over the entire United States, and even the world, while special brands have only a limited area of circulation. Therefore they can only obtain a local reputation, and with the constant changing of population and customers it is almost impossible ever to establish a very high or extended reputation for special brands of goods even if they carry special merit. The purchasing public have become so well informed that they at once recognize goods of standard or reliable manufacture, and look with suspicion on any new names or brands. In their estimation they are all seconds or of inferior quality.

I have no doubt that some merchants will claim that they are enabled to obtain better profit on special brands of goods, but I believe that the little that it is possible to squeeze from an intelligent public is more than offset by the extra amount of effort or time that is consumed by the merchant's salesman in endeavoring to convince a customer that special brands are more desirable than standard brands.

Nothing for the Retailer in Special Brands.

From a Connecticut Merchant: We have very decided opinions upon this subject. We never buy any goods of any kind or nature with a jobber's label on them, except possibly a job lot once in a while.

We have always been of the opinion that the better manufacturers would not put out their best product with any other label except their own, and it is always suspicious on our part that goods with a jobber's label are bought at less than the price of the best quality of goods. The jobber thus not only advertises his name, but makes a little larger margin of profit. We do not object so much to their making a profit as we do to their using us as a means of advertising their business. I cannot see anything to be gained for the retailer in handling goods with any label except that of the manufacturer of first quality goods. Of course, there are a great many articles that we handle with fictitious labels on them, but they are second grade as a rule.

Advertising the Jobber

We certainly have no use for goods with any label except either the manufacturer's or our own.

FROM A HOUSE DOING BOTH A WHOLESALE AND RETAIL BUSINESS

WE have always been more or less particular about the goods that bear our own name. If we cannot get the top notch under our own name, we handle it under the best factory brand that we can obtain for the price that we are compelled to sell the article at. We have some excellent goods under our own brand. We did handle Axes under our own brand which were unconditionally guaranteed by us, and we compelled the factory to do likewise with us, consequently we got goods that would stand the burden and build us up a good reputation. For the past year we have handled nothing in Axes with the exception of the factory brand, as private brands are of very little value to us unless we can have them perfectly correct.

Special Brands Guaranteed

As to Chisels, Drawing Knives, Saws, Hatchets, &c., we prefer them under the factory brand, as we believe that they carry with them a certain influence or prestige that cannot be controlled by the private brand. We know that factories often sell to jobbers seconds and thirds under private brand goods, that they would not, under any circumstances, put their own name on. These goods we have always steered clear of, as we do not think it is beneficial for us to handle that trash. But in having goods made for our own jobbing trade we have never listened to the factory about seconds or thirds, but we compelled them to give us the best they had or none at all, and any jobber can obtain this, if he wishes. Of course, a jobber often puts in something that he can cut the price of the factory; consequently, it is impossible for him to get as good an article under his own brand from the factory and be able to sell it for less money than the factory does. It is folly to think he can. That is the reason why special brands are not what they ought to be; but where the jobber is conscientious, and wants to go to his customer looking him square in the face, and tell him that he has an article that is beyond doubt first-quality goods under his brand, he can obtain them easy enough; but the retailer must know his man in purchasing special brand goods.

A Matter of Conscience

R. CHRISTENSEN, 88 Chambers street, New York, dealer in Upholsterers' and Cabinet Hardware, recently returned from an enjoyable trip to Northern Europe, and as pleasant reminders has some interesting photographs taken by his two daughters, who accompanied him, including some venturesome and unconventional snapshot views of Kaiser Wilhelm, King Leopold, the High Sheriff of London and others. The party sailed July 13 on the first Eastern voyage of the mammoth "Baltic," returning on her September 29. Places visited of special interest included Northern Norway and Sweden, Denmark, his natal country, last visited 30 years ago; Germany, France, Belgium and Great Britain. While in his native town and vicinity, Mr. Christensen became interested as an antiquarian in Grandfathers' Clocks over a century old, a number of which he finally purchased, and which he proposes to exhibit, at the above address, before distribution, they being now in course of erection.

THE STOWELL MFG. & FOUNDRY COMPANY, South Milwaukee, Wis., has recently completed a brick office building, 50 x 60 feet, two stories in hight, isolated from its manufacturing plant. This company, as already reported, has recently absorbed the Midland Mfg. Company of Racine, Wis., taking with it the Midland Adjustable Door Hanger and a successful line of Fire Door Hangers and Fittings which had been made by the latter company. R. A. Nourse, formerly secretary and treasurer of the Midland Company, has been made general sales manager of the Stowell Mfg. & Foundry Company.

AMONG THE HARDWARE TRADE.

Charles E. Woodruff has disposed of his Hardware business in Dodge, Neb., to E. W. Montgomery.

Phillips & Whitham, Hardware, Stove and Paint merchants, Fairfield, Neb., have been succeeded by Whitham & Wilkins, who continue at the old stand.

The Hardware, iron and steel, plumbing and heating and furniture business of E. A. Burbank, Berlin, N. H., has been incorporated under the style of the E. A. Burbank Company, Mr. Burbank being president and manager, and W. A. Boothby, treasurer. The capital stock of the company is $36,000, paid in. Important alterations in the establishment are contemplated in the near future.

W. E. McQueen & Co. have disposed of their Hardware, Stove, Implement and Sporting Goods business at Sterling, Col., to Henderson & Hayward Bros.

A. J. Salzgeber, formerly of Spring Valley, Minn., has bought the Hardware and Paint business of H. H. Grover at Lansing, Minn.

E. F. Simpson has disposed of his interest in the Hardware firm of Crandell & Simpson to Fred. Gerth, and the style is now Crandell & Gerth.

Hawes-Owsley Hardware Company, has recently opened a fine new store at Elberton, Ga. The establishment is a commodious one and exceptionally well arranged. The company is carrying on both a wholesale and retail business in Hardware, Iron and Steel, Mill Supplies, Stoves, Agricultural Implements, Sporting Goods, &c. The officers are as follows: A. S. Hawes, president; H. M. Owsley, vice-president; E. H. Turner, second vice-president, and E. N. Hailey, secretary and treasurer.

Farmers' Hardware Company, Galt, Mo., has been incorporated, with a capital stock of $5000, paid in, and will continue the retail business formerly conducted by A. R. Bondurant, who will manage the store.

Montgomery & Son have purchased the Hardware business of C. E. Woodruff, Dodge, Neb., and will continue at the old stand.

Whitaker & Jewell are successors to W. A. Smith in the Hardware business at Byron, Ill.

F. E. Crawford has disposed of his Hardware, Stove and Implement business in Skidmore, Mo., to D. D. Perkins, formerly of the firm of D. D. Perkins & Co., dealers in general merchandise, Craig, Mo. Mr. Perkins expects to add materially to the stock thus acquired.

Shoudy Bros., Atlantic, Iowa, have sold their Hardware and Stove stock to Marquis Mercantile Company.

F. E. Gieseker, who recently purchased the Hardware store of F. A. Huston, Humboldt, Neb., has just disposed of the business to Mr. Hutton of Orchard, Neb.

J. W. Turner has disposed of his Shelf and Heavy Hardware and Paint business in Beaver City, Neb., to Wm. Yeiser.

S. C. Wright has sold a half interest in his Hardware business at Santa Ana, Cal., and the style is now Wright & Kendall.

Nielsen & Read are successors to Nielson, Read & Edgerton in the Hardware, Stove, Implement, Paint, Sporting Goods and furniture business at Monroe, Neb.

W. J. Raymond of the firm of Raymond & Bailey, Mason City, Iowa, has disposed of his interest in the business to his partner, L. R. Bailey, who has been succeeded by the Bailey-Downing Hardware Company, comprising Mr. Bailey, George Downing and Perry Bailey. The company will continue the wholesale and retail business in general Hardware.

Vonderhaar Hardware Company has bought the Hardware, Stove and Tinware business formerly conducted by Philip Entler & Son, West Point, Iowa.

Wilson & Robinson have sold their business in Reinbeck, Iowa, to Reinbeck Hardware & Implement Company.

The Hardware business at Wolfeboro, N. H., formerly conducted by W. H. Swett has been sold to Harry M. Bickford, who will continue at the old stand.

THE MYERS ADJUSTABLE HORSE SHOE COMPANY.

THE MYERS ADJUSTABLE HORSE SHOE COMPANY, Louisville, Ky., has been organized with a capital of $150,000, with Colonel Morris B. Belknap of the Belknap Hardware & Mfg. Company, president; John W. Myers, the inventor of the Horse Shoe, vice-president, and S. B. Hart, secretary and treasurer. The special feature of this Horse Shoe is in the calks, which are removable or renewable in less than a minute's time by any one. The calks are held rigidly in place by a small steel spring that cannot slip or get out of position. In the near future a plant will be erected, probably in Louisville, but for the present the company is having its Shoes made on contract with Pittsburgh and Cleveland factories.

REQUESTS FOR CATALOGUES, &c.

The trade are given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations, &c., relating to general lines of goods.

REQUESTS *for catalogues, price-lists, quotations, &c., have been received from the following houses and are referred to the manufacturers:*

FROM H. N. & W. E. CARLTON, Shreveport, La., who are about to open a retail Hardware store in that city, and desire copies of catalogues and discount sheets.

FROM W. L. LITTLE HARDWARE COMPANY, Muncie, Ind., which has been incorporated with a capital stock of $15,000 to carry on the wholesale and retail business in Shelf and Heavy Hardware, Paints and Oils, &c. The company succeeds W. L. Little, formerly of the firm of Little & Oakley, and will continue at the old stand.

FROM JOSEPH MALTBY & Co., College Springs, Iowa, who have succeeded Stevenson & McCullough in the Hardware and Furniture business.

FROM FOLEY HARDWARE COMPANY, South Framingham, Mass., which has recently commenced business in general Hardware, Sporting Goods, &c.

FROM JACKSON HARDWARE COMPANY, Lorimor, Iowa, successor to Foster Hardware Company.

FROM HEINCK BROS., Long Prairie, Minn., who have purchased the Dettler Hardware and Stove business and have rebuilt the store.

FROM JOHNSON & BOWMAN, Vanlue, Ohio, who have lately opened up in the General Hardware and Implement Business.

THE MECHANICAL ACCOUNTANT COMPANY, Providence, R. I., has issued a booklet devoted to its Mechanical Accountant, which is already in wide use in offices and other places where a great deal of arithmetical work has to be done. The machine is shown in its details, together with a complete description of its methods of operation and its purposes. The evolution of the Mechanical Account-

ant is treated upon, from the abacus of the ancient Greeks and the Chinese swan pan to the modern instrument which robs many offices of much annoying labor and saves the employers money in the way of clerk hire.

NATIONAL WIRE CLOTH COMPANY.

THE NATIONAL WIRE CLOTH COMPANY, 116 Lake street, Chicago, Ill., is just entering the market with an annual capacity of about 15,000,000 square feet of Wire Cloth. The plant of this company has been newly equipped at Niles, Mich., where it adjoins the Garden City Fan Company's plant, from which power is received. F. A. Hastings, the president of the company, states that his plant is equipped with looms of a new pattern which are turning out Cloth of a superior quality, and that the methods for painting and drying the Cloth embody valuable new features. The plant when in full operation will employ about 50 men. C. K. Anderson is secretary of the company.

BRITISH LETTER.

Offices of *The Iron Age*, HASTINGS HOUSE, NORFOLK ST., LONDON, W. C., October 15, 1904.

The Week's Hardware Trade.

THE Hardware and allied industries are this week in a more hopeful state of mind, but mainly on account of export. The revival of business with the Argentine Republic continues unabated, good crops and freedom from internal disturbances having led to increased demands for such materials as Wrought Iron Bars and Shapes, Cast Iron Goods, Railroad Material, Galvanized Sheets, Cutlery, Enamelled Hollow Ware and Agricultural Machinery. There is an improvement in the Australasian market, the demand having increased for Wire (largely needed to restrain the rabbit plague), Galvanized Goods, Cutlery and Hardware, Mining Tools, Saddlery and Harness. Taking Hardware generally, there has been an expansion of business with Europe (except Spain), the United States, the foreign West Indies, South America, India, where the advance has been considerable, and Canada. The only other declining market in addition to the one already mentioned is South Africa. Cutlery shows very much the same characteristics, except that the falling off includes Belgium and New Zealand, in addition to the other two countries. Copper Sheets have been in smaller request from India, but the requirements of Turkey, Egypt, Brazil, Australia and New Zealand have grown. India, however, takes an increasing quantity of yellow metal, and so does China.

In the matter of the home trade, the London demand is better and so is that of some of the larger Lancashire towns, now that the cotton trade is attaining more healthy conditions, but the increase of activity which is resulting is not leading to any substantial additions to staffs, nor will it, unless a remarkable change takes place very soon, do much towards making up for the deficiencies of the year, which has been one of the worst known for some time. Silver and electro-plate manufacturers have had a less unfortunate experience. Some of the larger firms, in fact, seem to have maintained their turnover in spite of difficulties. At present they are experiencing a good inflow of orders for Fancy Silver and Electro Goods for the home trade.

Attempt to Organize the Galvanized Hollow Ware Trade.

A second attempt was made this week to organize the Galvanized Wrought Hollow Ware trade upon a pooling basis. At the previous attempt it was stated that the proposal would not be proceeded with, unless every member of the trade should join the association. The scheme failed, because a number of prominent firms would not come in. By way of alternative the dissentients were prepared to adhere to any price-list which might be drawn up, and, further, have stated their willingness to reconsider when they were quite satisfied that all the members of the organization were anxious to act. The scheme of organization includes manufacturers of all kinds of Buckets, Tubs, Washups, Coal Scoops, Slop-pails, Turnip Skips, Watering Pots, Beer and Paint Cans, Dustbins and Sanitary Pails, and the purpose of the organization is "to decide upon prices and discounts at which each member shall sell, to adjust and rectify any advantage one member may have over another . . . and to deal with other trade matters which may arise." The secretary is to ascertain the total net value of Galvanized Wrought Hollow Ware sold by each member of the association during the months of July, August and September, 1904, and the percentage which each member's sales bear to the whole. This is to be repeated every three months, and those members whose percentage of the total sales is found to have increased are to pay into the common fund of the association 5 per cent. of the amount of such increase, and those members whose percentage is found to have diminished are to receive out of the common fund 5 per cent. of such diminution. Further, those whose percentage of sales shows an increase, as compared with the first quarterly ascertainment, may be required to order goods from those who have suffered a decrease in their sales, subject to the allowance of 10 per cent. commission and to the goods being of satisfactory quality. The remuneration of agents is limited to 2½ per cent., and it is stipulated that no customer of any agent may act as an agent.

Provision is made for penalizing members who infringe the rules, and for the annual distribution of surplus funds; while a final stipulation is to the effect that no contracts are to be entered into for the sale of goods, unless for delivery within three months of the date of order, except for Government, municipal, or other local authorities.

It is thought that even now the number of abstentions will be large enough to nullify the scheme.

The Liege International Exhibition.

Some time ago I drew attention in these columns to the forthcoming Liége Exhibition. British manufacturers are bestirring themselves to be well represented, and I would suggest that American exporters to Europe should also make it a point to show their goods to full advantage. The exhibition, which will cover arts, sciences and manufactures, will be opened at Liége under royal patronage, on April 22, 1905. The leading European countries have signified their intention of participating in the exhibition, and the United States and Canada will be officially represented.

Tin Plates.

Stocks of Tin Plates in South Wales have been reduced by over 27,000 boxes, and stand now at 113,000 The demand continues unabated, and unless the output is materially increased, prices are likely to be maintained. Bessemer oil sizes are selling at 11 shillings 9 pence to 12 shillings, according to terms of delivery; Siemens Plates at 16 shillings 10½ pence to 17 shillings, and Finished Black Plate at £8 10s. to £8 12s. 6d. Several of the mills at the Kidwelly Tin Plate Works have just been restarted, and at the old Castle Works, Llanelly, something like £15,000 is being spent on modernizing the plant.

The German Cutlery Trade.

The annual report of the Solingen Chamber of Commerce shows that competition is seriously affecting the German Cutlery trade. On the one hand, the Solingen manufacturers are being undersold by their Thuringen rivals, who purchase half finished material in Solingen, and are enabled by the lower wages they have to pay to supply the goods in a finished state cheaper than it is possible for Solingen to do. On the other hand, Sweden is flooding the German market with Carving and Kitchen Knives, and has already seriously injured the Solingen trade in these articles. The Chamber of Commerce complains that the difficulty of placing Solingen Cutlery abroad is continually increasing. The industries of foreign States are partly protected by high duties, and in other cases more favorable conditions of production prevail; for instance, lower wages are paid than in Germany. The development of foreign competition is also furthered by the practice which German firms have adopted of supplying foreign manufacturers with unfinished blades. This has been felt during the past year, particularly in the Scissors trade; increasingly large quan-

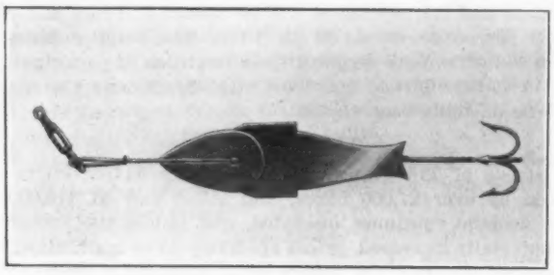
tities of unfinished goods are sent abroad and are worked up so cheaply that Solingen is utterly unable to compete with them. The business in Pocket Knives has been good and large quantities have been exported.

False Description of Goods in South Africa.

Reporting on the subject of the sale of White and Red Lead, &c., wrongly marked as "genuine" when lower grades of this article are being disposed of, the Management Committee of the Cape Town Chamber of Commerce states that the Cape Town Hardware Association and others interested in this matter have rendered valuable assistance in the endeavor to obtain the recognition of a uniform practice for the accurate designation of the various grades known by the trade. As the outcome of these negotiations it has been resolved to communicate with the Port Elizabeth and East London Chambers of Commerce with the object of obtaining their support to a recommendation by the Government for the adoption of a system such as obtains in India—viz., that only such articles shall be passed by the customs authorities as show clearly whether they are genuine, or, if not, the actual percentage of the adulteration, and that all such importations which do not comply with this requirement are liable to be seized by the Customs on examination.

The Mohawk Darter.

The Mohawk darter, illustrated herewith, is a new bait manufactured by Clark-Horrocks Company of Utica, N. Y. It is made in two sizes, one for trolling and another for casting. The bait has the double advantage of

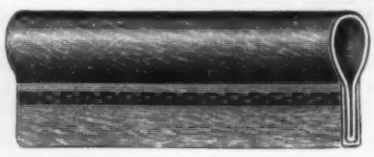


The Mohawk Darter.

revolving and darting at the same time, and is offered in response to the demand of fishermen for a bait of this kind which exactly resembles a minnow as it goes through the water chased by a big fish. The bait is put up one on a card, each card in a box, and is designed to retail at 25 cents. The company will be pleased to send samples upon application.

Cushion All Felt Weather Strips.

The D. W. Bosley Company, Fulton and May streets, Chicago, Ill., is offering all felt weather strips, the ac-



Cushion All Felt Weather Strips.

companying cut representing the No. 20, the largest of three sizes. The features of this strip are the cushion edge obtained by the manner of construction, giving, it is pointed out, a better and closer contact than the straight edge felt used in the old style wood and felt strip; also the manner of packing, this being put up in 50-foot cartons about 10 inches square, making convenient packages as shelf goods and keeping the strip in shape and free from dust and dirt. Another advantage to which attention is directed is its simplicity, as it can be applied by any one, the only tools necessary being shears and tack hammer.

Swan's Expansive Bit.

The James Swan Company, Seymour, Conn., whose sole agent is Russell & Erwin Mfg. Company, New Britain, Conn., and 43-47 Chambers street, New York, has put on the market Swan's patent expansive bit, here shown. The peculiarity of this expansive bit is that it

Swan's Patent Expansion Bit with Twist.

has a twist that will permit of rapid boring and the discharge of a continuous chip, thus applying a new principle to an otherwise well known form of bit. Another point made by the manufacturer is that a secure and exact adjustment is assured. They are made in sizes Nos. 1 and 2, the former cutting from ½ to 1½ inches and the No. 2 ⅞ to 3 inches. They are packed one each in a box and six in a package.

New Ideal Bullet No. 360,270.

The Ideal Mfg. Company, New Haven, Conn., has just brought out a new bullet for the .38 S. & W. military and Colt's .38 caliber revolvers, as shown in Fig. 1. The bullet has a cavity in the front end and a flat base, and

Fig. 1.—New Ideal Bullet No. 360,270.

Fig. 2.—Bullet in Shell.

is made sufficiently large in diameter to insure a perfect gas tight fit in the barrel without any upsetage. It is grooved the whole length, and the base portion that fits in the shell is 0.360 inch and is seated very snugly in the shell up to the small beveled groove, Fig. 2, where the shell may be crimped if desired, but is said to be best without crimp. The forward portion that projects beyond the muzzle of the shell is 0.358 inch in diameter, which is the same size as the smaller portion, *a*, of the chamber of the cylinder, as shown in Fig. 3, which has a

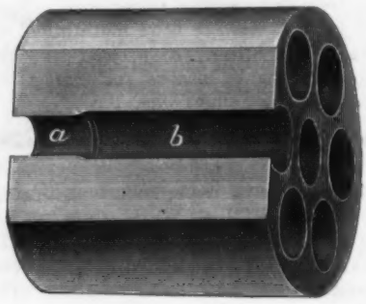


Fig. 3.—Revolver Cylinder.

portion cut away so as to show the inside formation of the chamber in which the loaded cartridge fits. It is claimed that with the bullet fitting snugly in the shell and the shell left straight at the muzzle, not crimped, the bullet will not be mutilated, scraped or deflected by the inturned edge of the shell when passing out. With

the bullet and shell placed in the chamber, the shell fitting in the portion *b* and the forward part of the bullet in the chamber *a*, shell and bullet must then be in perfect alignment, it is explained, which tends to secure accuracy. The ammunition has been thoroughly tested with machine rest. The bullet, it is pointed out, cuts a clean, full sized hole in the target, thus obviating disputes in count as to whether the ring on the target is cut or not. It is also referred to as a very deadly missile, as it cuts a large hole in an animal and permits a free flow of blood. Molds and reloading tools are now ready for the market.

The Marvel Combined Shear and Punch.

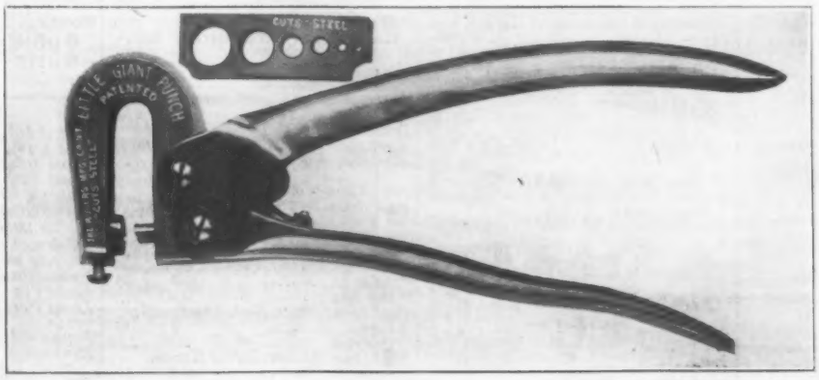
We illustrate herewith a light, inexpensive combination punch and shear built on a new principle and embodying a number of new features of importance. The

The Marvel Combined Shear and Punch.

shear consists of a heavy malleable body and two levers attached to the central shaft. The outer lever, which is also the longer one, is keyed to an eccentric bearing which gives a throw of about ½ inch. The inner and shorter lever is keyed to another eccentric or sleeve which fits over the shaft of the longer lever. Another eccentric is found at the opposite end of the shaft, where it engages a moving block or bearing. The longer bearing, with its greatest throw, is used for light work, while for heavier work the two levers are locked together, reducing the coarseness of the cut and correspondingly increasing the power. Power and leverage can be still further increased by using the long and short levers independent of each other, the power being exerted on the long lever and the short lever being moved forward with each stroke of the long lever, maintaining a relationship between the two which gives a very small motion to the cutting tool at an extremely high leverage. By using the two levers in this way in a sort of pumping motion the operator, it is stated, can with but little effort cut a piece of ½ x 2 inch steel, using one hand for the long lever and the other for the short lever. This applies equally to the punching side of the tool, as the same levers, moved in the opposite direction, actuate the punching mechanism on exactly the same plan. Here, too, a single stroke of the lever accomplishes the work in lighter material, while a reciprocating motion of the long lever and a gradual forward motion of the short lever are used to force the punch through heavy work. The machine cuts flats up to and including ½ inch or will cut angle bars in two cuts, one for each leg, and will easily handle rounds up to and including ¾ inch diameter. Where large rounds are cut in the knife portion of the machine the edge is not perfectly clean, as is apt to be the case in any knife shear. In order to cut rounds with a clean, sharp edge a supplementary knife is screwed to the moving half of the main frame and holes are drilled through the tool of the proper size to admit rounds from ¾ to ¼ inch in diameter. The long bar of round to be cut is inserted in the proper orifice and the levers are used the same as if cutting were done on the outer knife. The illustration shows a bar inserted in each of the five openings of this kind. At the right of the illustration is shown a gauge or guide which is slipped in a bearing just below the knife edge and thus used for cutting bars of a given length either on the outer or inner knife. The whole tool is carefully machined and as it contains no gears it is unusually durable for its size and weight. The machine is sold either independently or including malleable iron legs. The mechanism weighs about 135 pounds, so it is readily portable. It is made by Blum Brothers Company, 1195-1197 North California avenue, Chicago, Ill.

Little Giant Hand Punch.

Rogers Mfg. Company, 147 West Twenty-third street, New York, is making the Little Giant hand punch, Zacharias' patent, here shown. The punch is 7 inches long over all, and has a throat with 1⅜ inches opening to center of punch. The parts are drop forged from steel, and the steel screws are hardened. All parts are interchangeable, and dies to punch holes from 1-16 to ½ inch diameters, inclusive, can be used in the one size tool, except that for the largest diameters the head of tool is somewhat wider to accommodate the die. Usually a medium size is sent, but any size within the diameters mentioned, any combination of sizes or all sizes can be furnished with a single tool if so ordered. The tool is polished and nickeled with a coil steel wire spring to expand the handles. Any of the sheet metals within reasonable gauges, leather, cloth, paper and kindred substances can be punched. The company recommends it for electrical work, punching, it says, a clean hole through slate without cracking the material. Many other purposes for which a quick working hand punch can be advantageously used will suggest themselves.



Little Giant Hand Punch.

Current Hardware Prices.

REVISED OCTOBER 25, 1904

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer, are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33⅓@33⅓ & 10% signifies that the price of the goods in question ranges from 33⅓ per cent. discount to 33⅓ and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued May, 1904, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Adjusters, Blind—

Domestic, ₱ doz. $3.00.....33⅓%
North's.....10%
Zimmerman's—See *Fasteners, Blind.*

Window Stop—

Ives' Patent.....35%
Tapitu's Perfection.....35%

Ammunition—See *Caps, Cartridges, Shells, &c.*

Anvils—American—

Eagle Anvils.....₱ ℔ 7¼@7¾c
Hay-Budden, Wrought.....9@9¼c
Horseshoe brand, Wrought.....9@9¼c
Trenton.....₱ ℔ 9@9¼c

Imported—

Peter Wright & Sons.....₱ ℔ 10¼c

Anvil, Vise and Drill—

Millers Falls Co., $18.00.....15&10%

Apple Parers—See *Parers, Apple, &c.*

Aprons, Blacksmiths'—

Hull Bros. Co.....30&10%
Livingston Nail Co.....35%

Augers and Bits—

Com. Double Spur.....75@75&10%
Boring Machine Augers..70&10@75%
Car Bits, 12-in. twist.....60@60&10%
Jennings' Pattern.....60&10&10@10%
Ford's Auger and Car Bits.....40&5%
Forstner Pat. Auger Bits.....25%
C. E. Jennings & Co.:
No. 10 ex. lip. R. Jennings' list.....25%
No. 90. R. Jennings' List.....40&7½%
Russell Jennings'.....25&10&2½%
L'Hommedieu Car Bits.....15%
Mayhew's Countersink Bits.....45%
Millers' Falls.....30&10&7½%
Ohio Tool Co.'s Bailey Auger and Car Bits.....40&10%
Pugh's Black.....20%
Pugh's Jennings' Pattern.....35%
Snell's Auger Bits.....60%
Snell's Bell Hangers' Bits.....60%
Snell's Car Bits, 12-in. twist.....60&10%
Wright's Jennings Bits (R. Jennings' list).....50%

Bit Stock Drills—

See *Drills, Twist.*

Expansive Bits—

Clark's small, $18; large, $26.....50&10%
Clark's Pattern, No. 1, ₱ doz., $26; No. 2, $18.....50&10%
Ford's, Clark's Pattern.....50&10&10%
C. E. Jennings & Co., Steer's Pat.....25%
Swan's.....6%

Gimlet Bits—

Common Double Cut..gro. $3.00@3.25
German Pattern.....gro. $4.50@4.75

Hollow Augers—

Bonney Pattern, per doz. $10.00@11.00
Ames.....25&10%
New Patent.....25&10%
Universal.....20%
Wood's Universal.....25%

Ship Augers and Bits—

Ford's.....40%
C. E. Jennings & Co.:
L'Hommedieu's.....15%
Watrous'.....35&5%
Ohio Tool Co.'s.....40%
Snell's.....40%

Awl Hafts, See *Hafts, Awl.*

Awls—

Brad Awls:
Handled.....gro. $2.75@3.00
Unhandled, Shouldered.gro.63@66c
Unhandled, Patent.....gro. 66@70c
Peg Awls:
Unhandled, Patent....gro. 31@34c
Unhandled, Shouldered.gro.65@70c
Scratch Awls:
Handled, Common..gro. $3.50@4.00
Handled, Socket..gro. $11.50@12.00
Hurwood.....40%

Awl and Tool Sets—See *Sets, Awl and Tool.*

Axes—

Single Bit, base weights (up to 3¼ lb.)
First Quality.....$6.50
Second Quality.....$5.75
NOTE.—Heavier Weights add Extras as per regular schedule.

Axle Grease—See *Grease, Axle*

Axles—

Iron or Steel
Concord, Loose Collar.....4@4½c
Concord, Solid Collar.....4½@5c
No. 1 Common.....3¼@3¾c
No. 1½ Com. New Style.....3¾@4¼c
No. 2 Solid Collar.....4¼@5c
Nos. 7, 8, 11 and 12.....75@75&5%
Nos. 13 to 14.....70&10@75&5%
Nos. 15 to 18.....65&10@60&10&10%
Nos. 19 to 22.....70&10@75%

Boxes, Axle—

Common and Concord, not turned.. lb. 4½@4½c
Common and Concord, turned..... lb. 5@5¼c
Half Patent.....lb. 9@9½c

Bait—Fishing—

Hendryx:
A Bait.....20%
B Bait.....25%
Competitor Bait.....20&5%

Balances—Sash—

Caldwell new list.....50%
Pullman.....50&10@60%

Spring—

Spring Balances.....60@60&5%
Chatillon's:
Light Spg. Balances.....40&10%
Straight Balances.....40%
Circular Balances.....50%
Large Dial.....30%

Barb Wire—See *Wire, Barb.*

Bars—Crow—

Steel Crowbars, 10 to 40 lb., per lb..... 2½@3¾c

Towel—

No. 10 Ideal, Nickel Plate.....₱ gro, $8.50

Beams, Scale—

Scale Beams.....40&10@5%
Chattillon's No. 1.....30%
Chattillon's No. 2.....40%

Beaters—Carpet—

Holt-Lyon Co.:
No. 12 Wire Coppered ₱ doz $0.85; Tinned.....$1.00
No. 11 Wire Coppered ₱ doz. $1.10; Tinned.....$1.20
No. 10 Wire Galvanized.....₱ doz. $1.75
Western W. G. Co.
No. 1 Electric.....₱ gro. $7.80
No. 2 Buffalo.....₱ gro. $9.00
No. 3 Perfection Dust.....₱ gro. $8.00

Egg—

Holt-Lyon Co.:
Holt, No. A, Japanned.....₱ doz. $1.20
Holt, No 1, Tinned.....₱ doz. $1.50
Holt, No. B, Japanned.....₱ doz. $2.00
Holt, No. 2, Tinned.....₱ doz. $2.25
Lyon, No 2, Japanned.....₱ doz. $1.25
Lyon, No. 3, Japanned.....₱ doz. $1.50
Taplin Mfg. Co.: ₱ gro.
No. 60 Improved Dover.....$6.00
No. 75 Improved Dover.....$8.50
No. 100 Improved Dover.....$7.00
No. 102 Improved Dover, Tin'd...$8.50
No. 150 Improved Dover, Hotel..$15.00
No. 152 Imp'd Dover, Hotel, T'd..$17.00
No. 200 Imp'd Dover Tumbler.....$8.50
No. 202 Imp'd Dover Tumbler, Tin'd $9.50
No. 300, Imp'd Dover Mammoth, ₱ doz.....$25.00
Western, W. G. Co., Buffalo.....$7.00
Wonder (S. S. & Co.).....₱ gro. net, $6.00

Bellows—

Blacksmith, Stand. List.60&10@70&10%

Blacksmiths'—

Inch..	*30*	*32*	*34*	*36*	*38*	*40*
Each..	*$3.25*	*3.50*	*4.00*	*4.50*	*5.00*	*5.75*

Extra Length:

Each..	*$3.75*	*4.25*	*4.75*	*5.25*	*6.00*	*7.00*

Molders—

Inch.....	*10*	*12*	*14*
Doz.....	*$8.50*	*10.00*	*13.00*

Hand—

Inch.....	*6*	*7*	*8*	*9*	*10*
Doz.....	*$4.25*	*4.50*	*5.00*	*6.50*	*7.75*

Net Prices.

Bells—Cow—

Ordinary goods.....75&5@75&10%
High grade.....70&10@70&10&5%
Jersey.....75&10%
Texas Star.....50%

Door—

Abbe's Gong.....45%
Burton Gong.....50%
Home, R. & E. Mfg. Co.'s.....55&10%
Lever and Pull, Sargent's.....60&10&10%
Trip Gong.....50&10@50&10&5%
Yankee Gong.....35%

Hand—

Hand Bells, Polished, Brass..... 60&5@60&10&5%
White Metal.....60%
Nickel Plated.....50&10@50&10&5%
Swiss.....60@60&7½%
Cone's Globe Hand Bells.....33⅓@35%
Silver Chime.....33⅓@35%

Miscellaneous—

Farm Bells.....lb. 2¼
Steel Alloy Church and School..... 50&10&5@60&5%
American Tube & Stamp'g Co. Gongs..75%
Table Call Bells.....50@50&10%

Belting—Leather—

Extra Heavy, Short Lap....60@60&5%
Regular Short Lap 60&10@50&10&10%
Standard.....70@70&5%
Light Standard.....70&10%
Cut Leather Lacing.....60&10%
Leather Lacing Sides, per sq. ft..18c

Rubber—

Agricultural (Low Grade)..75@75&5%
Common Standard.....70@70&10%
Standard.....65@70%
Extra.....60&5@60&10%
High Grade.....59&5@50&10%

Bench Stops—See *Stops, Bench*

Benders and Upsetters, Tire—

Detroit Perfected Tire Bender.....40%
Green River Tire Benders and Upsetters.....20%
Detroit Stoddard's Lightning Tire Upsetters, No. 1, $4.25; No. 2, $7.25; No. 3, $10.50; No. 4, $16.25; No. 5, $20.50.

Bicycle Goods—

John S. Leng's Son's 1902 list:
Chain.....50%
Parts.....50%
Spokes.....50%
Tubes.....60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See *Augers and Bits.*

Blocks—Tackle—

Common Wooden.....70&10@75&5%
Hartz Steel Tackle Blocks.....50&50&5%
Hollow Steel Blocks, with Ford's Patent Sheaves.....50&10%
Lane's Patent Automatic Lock and Junior.....30%
Stowell's Novelty, Mal. Iron.....50&10%
Stowell's Self Loading.....60%
See also *Machines, Hoisting.*

Boards, Stove—

Zinc, Crystal, &c.....30&10@40&10%

Boards, Wash—

See *Washboards.*

Bolts—Carriage, Machine, &c.—

Common Carriage:
⅜ x 6 and Smaller.....75&10@80%
Larger sizes.....75@75&10%
Phila. Eagle, $3.00 list May 24, '99.... 80&10%
Boll Ends, list Feb. 14, '95.....75@.....%
Machine.....75&5@75&10&5%
Machine with C. & T. Nuts..... 70&5@.....%

Door and Shutter—

Cast Iron Barrel, Round Brass Knob:

Inch.....	*3*	*4*	*5*	*6*	*8*
Per doz...	*$0.26*	*.30*	*.39*	*.47*	*.65*

Cast Iron Spring Foot:

Inch.....	*6*	*8*	*10*
Per doz.....	*$1.00*	*1.35*	*1.75*

Cast Iron Chain, Flat, Japanned:

Inch.....	*6*	*8*	*10*
Per doz.....	*$0.75*	*1.05*	*1.30*

Cast Iron Shutter, Brass Knobs:

Inch.....	*6*	*8*	*10*
Per doz.....	*$0.57*	*.80*	*1.00*

Wrt Barrel, Jap'd..75&10@75&10&10%
Wrt " Bronzed..50&10@50&10&10%
Wrought Spring..70&10@70&10&10%
Wrt. Shutter...50&10@50&10&10&5%
Wrt. Square Neck..70&10@70&10&10%
Wrt. Square...66⅔&10@66⅔&10&10%
Ives' Patent Door.....60%

Stove and Plow—

Plow.....65&10@.....%
Stove.....30&5@30&10&5%

Tire—

Common.....7½%
Norway Iron.....30%
American Screw Company:
Norway Phila., list Oct. 16, '84.....80%
Eagle Phila., list Oct. 16, '84.....82½%
Bay State, list Dec. 28, '99.....72½%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '84.....80%
Eagle Phila., list Oct. 16, '84.....82½%
Eclipse, list Dec. 28, '99.....72½%
Russell, Burdsall & Ward Bolt & Nut Co.
Empire, list Dec. 28, '99.....72½%
Norway Phila., list Oct. '84.....80%
Upson Nut Co.:
Tire Bolts.....72½%

Borers, Tap—

Borers Tap, Ring, with Handle:

Inch.....	*1¼*	*1½*	*1¾*	*2*
Per doz..	*$4.50*	*5.00*	*5.75*	*7.25*
Inch.....		*2¼*		*2½*
Per Doz.....		*$8.65*		*11.50*

Enterprise Mfg. Co., No. 1, $1.35; No. 2, $1.65; No. 3, $2.50 each.....25%

Boxes, Mitre—

C. E. Jennings & Co.....30%
Langdon.....15&10%
Perfection.....₱ doz. $30.00
Schatz.....40%

Braces—

Common Ball, American..$1.15@1.25
Barber's.....50&10&10@60&10%
Fray's Genuine Spofford's.....60%
Fray's No. 70 to 120, 81 to 123, 207 to 414.....60%
C. E. Jennings & Co.....50&5%
Mayhew's Ratchet.....60%
Mayhew's Quick Action Hay Patent..50%
Millers Falls Drill Braces.....25&10%
P. S. & W. Co. Peck's Patent 60&10@65%

Brackets—

Wrought Steel.....80&10@....%
Bradley's Wire Shelf:
Full cases.....80&10&10%
Broken cases.....80&10%
Griffin's Pressed Steel.....80%
Griffin's Folding Brackets.....70&10%
Stowell's Cast Shelf.....75%
Stowell's Sink.....50%
Western, W. G. Co., Wire.....60&10%

Bright Wire Goods—See *Wire and Wire Goods.*

Broilers—

Western, W. G. Co.....80%
Wire Goods Co.....75@75&10%

Buckets, Galvanized—

Price per dozen.

Quart.....	*10*	*12*	*14*
Water, Regular..	*1.40*	*1.70*	*1.90*
Water, Heavy....	*3.40*	*3.70*	*3.80*
Fire, Rd. Bottom.	*2.30*	*2.55*	*2.95*
Well.....	*2.55*	*2.87*	*3.15*

Bucks, Saw—

Hoosier.....₱ gro. $36.00

Bull Rings—See *Rings, Bull.*

Butts—Brass—

Wrought list Sept., '96.....20@30%
Cast Brass, Tiebout's.....50%

Cast Iron—

Fast Joint, Broad.....50@50&10%
Fast Joint, Narrow.....50@50&10%
Loose Joint.....70&5@70&10%
Loose Pin.....70&5@70&10%
Mayer's Hinges.....70&5@70&10%
Parliament Butts.....70&5@70&10%

Wrought Steel—

Table and Back Flaps.....75%
Narrow and Broad.....75%
Inside Blind.....75&10%
Loose Pin.....75%
Loose Pin, Ball and Steeple Tip 80&20%
Japanned, Ball Tip Butts.70&10%
Bronzed Wrt. Nar. and Inside Blind Butts.....55&10%

Extra 10@10&10%

Cages, Bird—

Hendryx, Brass:
3000, 5000, 1100 series.....5%
1200 series.....33⅓%
200, 300, 600 and 900 series.....40&10%
Hendryx Bronze:
700, 800 series.....40&10%
Hendryx Enameled.....40&10%

Calipers—See *Compasses.*

Calks, Toe and Heel—

Blunt, 1 prong.....per lb..4@4½c
Sharp, 1 prong.....per lb. 4½@4¾c
Gautier, Blunt.....4@4½c
Gautier, Sharp.....4½@4¾c
Perkins', Blunt Toe.....₱ ℔ 3.65
Perkins', Sharp Toe.....₱ ℔ 4.15

Can Openers—See *Openers, Can*

Cans, Milk—

	5	8	10 gal.
Illinois Pattern.	$1 35	1.85	2.05 each.
New York Pattern	1.50	2.20	2.45 each.
Baltimore Pattern	1.50	2 20	2 45 each.
Dubuque	1.35	1.60	1.75 each.

Cans, Oil—

Buffalo Family Oil Cans:

3	5	10 gal.
$48.00	60.00	120.00 gro., net

Caps—Percussion—

Eley's E. B......52@55c
G. D.....*per M* 34 @35c
F. I......*per M* 40 @42c
G. E.....*per M* 48 @50c
Musket.....*per M* 62@63c

Primers—

Berdan Primers, $2.00 per M...20&5%
B. L Caps (Sturtevant Sheet) $2.00 per M.....20%
All other primers per M. $1.52 @ $1.60

Cartridges—

Blank Cartridges:
38 C. F., $5 50.....10&5%
38 C. F., $7 00.....10&5%
22 cal. Rim, $1 50.....10&5%
32 cal. Rim, $2.75.....10&5%
B. B. Caps, Con. Ball Swgd.....*$1 90*
B. B. Caps, Round Ball.....*$1.50*
Central Fire.....25%
Target and Sporting Rifle.....15&5%
Primed Shells and Bullets.....15&10%
Rim Fire Sporting.....50%
Rim Fire, Military.....15&5%

Casters—

Bed.....70@70&10%
Plate.....60&10@60&10&5%
Philadelphia.....75@75&10%
Acme, Ball Bearing.....33⅓%
Boss.....70&10%
Boss Anti-Friction.....70&10%
Gem (Roller Bearing).....80%
Martin's Patent (Phoenix).....45%
Standard Ball Bearing.....45%
Tucker's Patent low list.....30%
Yale (Double Wheel) low list.....50%

Cattle Leaders—
See *Leaders, Cattle.*

Chain, Coil—

American Coil, Straight Link;

3-16	¼	5-16	⅜	7-16	½	9-16
7.40	5.10	4.15	3.45	3.50	3.20	3.15
⅝	¾	⅞	1 to 1¼ inch.			
3.10	3.00	2.95	2.95	per 100 lb.		

German Coil.....60&10&10@70%

Halters and Ties—

Halter Chains.....60&10@60&10&10%
German Pattern Halter Chains, list July 24, '97.....60&10&10@....%
Cow Ties.....60@60&10%

Trace, Wagon, &c.—

Traces, Western Standard: 100 pair
6½—6-3, Straight, with ring...$23.50
6½—6-2, Straight, with ring...$21.50
6½—8-2, Straight, with ring...$28.00
6½—10-2, Straight, with ring...$32.00
Add 2¢ per pair for Hooks.
Twist Traces 2¢ per pair higher than Straight Link.
Trace, Wagon and Fancy Chains..60&5@60&10&5%

Miscellaneous—

Jack Chain, list July 10, '93:
Iron.....60&10@60&10&5%
Brass.....60&10@60&10&10%
Safety Chain.....75@75&10&5%
Gal. Pump Chain.....*lb* 4¼@4¼c
Covert Mfg. Co.
Breast.....40&2%
Halter.....40&2%
Heel.....40&2%
Rein.....40&2%
Stallion.....40&2%
Covert Sad. Works:
Breast.....70%
Halter.....70%
Hold Back.....70%
Rein.....70%
Oneida Community:
Am. Coil and Halters.....40@40&5%
Am. Cow Ties.....45@50%
Eureka Coil and Halter.....45@50&5%
Niagara Coil and Halters.....45@50&5%
Niagara Cow Ties.....45&5@50&10&5%
Niagara Wire Dog Chains.....45@50&5%
Wire Goods Co.:
Dog Chain.....70&10%
Universal Dbl-Jointed Chain.....50%

Chalk—(From Jobbers.)

Carpenters' Blue.....*gro.* 35@38c
Carpenters', Red.....*gro.* 30@33c
Carpenters', White.....*gro.* 25@28c
See also Crayons.

Checks, Door—

Bardsley's.....45%
Columbia.....50&10%
Eclipse.....60&10%

Chests, Tool—

American Tool Chest Co.:
Boys' Chests, with Tools.....55%
Youths' Chests, with Tools.....40%
Gentlemens' Chests, with Tools.....30%
Farmers', Carpenters', etc., Chests, with Tools.....20%
Machinists' and Pipe Fitters' Chests, Empty.....30%
Tool Cabinets.....5%
C. E. Jennings & Co.'s Machinists' Tool Chests.....33⅓&10%

Chisels—

Socket Framing and Firmer

Standard List.....70&10@70&10%
Buck Bros.....30%
Charles Buck.....30%
C. E. Jennings & Co. Socket Firmer No. 10.....60%
C. E. Jennings & Co. Socket Framing No. 15.....60%
Ohio Tool Co.'s.....70%
Swan's.....70%
L. & I. J. White.....30@30&5%

Tanged—

Tanged Firmers.....40&5@40&10%
Buck Bros.....30%
Charles Buck.....30%
C. E. Jennings & Co. Nos. 191, 181...25%
L. & I. J. White, Tanged.....25&5%

Cold—

Cold Chisels, good quality. lb. 15@15c
Cold Chisels, fair quality...lb. 11@12c
Cold Chisels, ordinary.....*lb. 9 @10c*

Chucks—

Beach Pat., each $8.00.....35&5%
Pratt's Positive Drive.....25%
Empire.....25%
Blacksmiths'.....25%
Skinner Patent Chucks:
Independent Lathe Chucks.....50%
Universal.....50%
Combination.....50%
Drill Chucks, New Model.....30%
Drill Chucks Standard.....40%
Drill Chucks, Skinner Patent, 0, 1, 2.....40%
Drill Chucks, Skinner Patent, 3, 4, 5, 6, 7, 8.....30%
Drill Chucks, Positive Drive.....30%
Planer Chucks.....25%
Face Plate Jaws.....40%
Standard Tool Co:
Improved Drill Chuck.....45%
Union Mfg. Co.:
Combination.....50%
Czar Drill.....35%
Combination Geared Scroll.....40%
Geared Scroll.....40%
Independent.....50%
Independent Steel.....40%
Union Drill.....45%
Universal.....50%
Independent Iron Face Plate Jaws..40%
Independent Steel Face Plate Jaws..40%
Westcott Patent Chucks:
Lathe Chucks.....50%
Little Giant Auxiliary Drill.....50%
Little Giant Double Grip Drill.....50%
Little Giant Drill, Improved.....50%
Oneida Drill.....50%
Scroll Combination Lathe.....50%

Clamps—

Adjustable, Hammers'.....20@20&5%
Cabinet, Sargent's.....50&10%
Carriage Makers', P., S. & W. Co.....50%
Carriage Makers' Sargent's.....60%
Besty, Parallel.....33⅓&10%
Linemans' Utica Drop Forge & Tool Co40%
Saw Clamps, see *Vises, Saw Filers'.*

Cleaners, Drain—

Iwan's Champion, Adjustable.....55%
Iwan's Champion, Stationary.....45%

Sidewalk—

Star Socket, All Steel....℔ doz. $4.05 net
Star Shank, All Steel....℔ doz. $3.24 net
W. & C. Shank, All steel, ℔ doz., 7½ in., $3.00; 8 in., $3.25.

Cleavers, Butchers'—

Foster Bros.....30%
New Haven Edge Tool Co.'s.....45%
Fayette R. Plumb.....33⅓&33⅓&10%
L. & I. J. White.....30%

Clippers—

Chicago Flexible Shaft Company
'98 Chicago Horse.....$8.75 } 15%
1902 Chicago Horse.....$10.75 }
20th Century Horse, each, $5.00.....20%
Lightning Belt.....$15.00 } 15%
Chicago Belt.....$20.00 }
Stewart's Patent Sheep.$12.75.....20%

Finger Nail Clippers

Smith & Hemenway Co.....doz. net $2.00

Clips, Axle—

Eagle 5-16 and ⅜ inch....75@75&10%
Norway, 5-16 and ⅜ inch..60&10@70%

Cloth and Netting, Wire
—*See Wire, &c.*

Cocks, Brass—

Hardware list:
Compression, Plain Bibbs, Globe, Kerosene, Racking, &c., Cocks. 70&10@75%

Coffee Mills—See *Mills, Coffee.*

Collars, Dog—

Nickel Chain, Walter B. Stevens & Son's list.....40%
Leather, Walter B. Stevens & Son's list40%

Combs, Curry—

Metal Stamping Co.....40%

Mane and Tail—

Covert's Saddlery Works.....60&10%

Compasses, Dividers, &c.

Ordinary Goods.....75&5@75&10%
Bemis & Call Hdw. & Tool Co.:
Dividers.....65%
Calipers, Double.....65%
Calipers, Inside or Outside.....65%
Calipers, Wing.....60%
Compasses.....50%

Conductor Pipe, Caiva —
L. C. L. to Dealers:

Territory.	*Nested.*	*Not nested.*
A. Eastern.	75c@12½%	75c@7½%
B. Eastern.	75c@12½&7½%	75c@12½%
Central.....	75c@12½%	75c&%
Southern..	70c@10c&%	70c@10%
S. Western..	70c@12½%	70c@7½%

Terms, 60 days, 2% cash, 10 days. Factory shipments generally delivered.
See also *Eave Troughs.*

Coolers, Water—

Gal. each.	2	3	4	6	8
Labrador	$1.20	$1.50	$1.80	$2.10	2.70
Gal.	3	4	6	8	
Iceland, ea.	$1.80	$2.10	2.40	$3.00	
Gal.	2	3	4	6	8
Galv. Lined Ea	$1.85	$2.00	$2.2	$2.90	$3.90

25%

Ga.v. Lined side handles

Gal.	2	4	6	8
Each.	$1.95	$2.15	$2.40	$3.3	$4.15..25%

Coopers' Tools—
See *Tools, Coopers'.*

Cord— Sash—

Braided, Drab.....*lb.* 35c
Braided. White, Com.....*lb.* 21@22c
Cable Laid Italian...*lb. A.* 15c; *B*, 16c
Common India.....*lb.* 10@10½c
Cotton Sash Cord, Twisted....11@14c
Patent Russia.....*lb.* ..@15c
Cable Laid Russia.....*lb.* ..@15c
India Hemp, Braided.....*lb* ..@18c
India Hemp, Twisted.....*lb.* 12@13c
Patent India, Twisted.....*lb.*12@13c

Anniston Cordage Co.: Braided Cotton.
Old Glory, Nos. 7 to 12.....℔ 28 ¢
Anniston, Nos. 7 to 12.....℔ 22 ¢
Old Colony, Nos 7 to 12.....℔ 22 ¢
Anniston Drab, Nos. 7 to 12...℔ 26 ¢
Pearl Braided, cotton, No. 6,℔ 22¢
Nos. 7 to 12 21¢.
Eddystone Braided. Nos. 7, 8, 9 and 10..
℔ 21¢
Eddystone Braided Cotton .No. 6,℔ 25¢
Harmony Cable Laid Italian. No. 7 to 10.....℔ 23¢
Peerless.....
Cable Laid Italian.....16¢
Cable Laid Russian.....14¢
Cable Laid India.....12¢
Braided India.....18¢
Samson, Nos. 7 to 12:
Braided, Drab Cotton.....℔ 36¼¢
Braided, Italian Hemp.....℔ 30¢
Braided, Linen.....℔ 53¢
Braided, White Cotton or Spot.℔ 38¢
Massachusetts, White.....℔ 28 ¢
Massachusetts, Drab.....℔ 32 ¢
Phœnix, White, No's 7 to 12.....24¢
No. 6 cords, 1¢ extra.
Silver Lake:
A quality, Drab.....40¢
A quality, White.....35¢
B quality, Drab.....33¢
B quality, White.....30¢
Italian Hemp......40¢
Linen......57½¢

Wire, Picture—

List Oct., '00. 85&10¢10@85&10¢10&5%
Hendryx Standard Wire Picture Cord..
85&10&5%

Cradles—

Grain.....40¢12½%

Crayons—

White Round Crayons, gross. 5½@6c
Cases, 100 gro., $4.00, at factory.
D. M. Steward Mfg. Co.
Jumbo Crayons.....gr. $3.50
Metal Workers' Crayons.gr. $2.50
Soapstone Pencils, round, flat or square.....gr.$1.50
Rolling Mill Crayons.....gr. $2.50
Railroad Crayons (composition) gr. $2.00
Case lots 20%
Zelnicker's Lumber:
Red, Blue, Green.....℔ gro. $6.50
Black.....℔ gro. $4.00
See also *Chalk.*

Crooks, Shepherds'—

Fort Madison, Heavy.....℔ doz. $7.00
Fort Madison, Light.....℔ doz. $6.50

Crow Bars—See *Bars, Crow.*

Cultivators—

Victor Garden.....50%

Cutlery, Table—

International Silver Company:
No. 12 Medium Knives, 1847..℔ doz. $8 50
Star, Eagle, Rogers & Hamilton and Anchor.....℔ doz. $3.00
Wm. Rogers & Son.....℔ doz. $2 50

Cutters— Glass—

H. H. Mayhew Co.....40%
Red Devil.....50%
Smith & Hemenway Co.....50%
Woodward.....40%

Meat and Food—

American.....30%

Nos.	1	2	3	4	B	5
Each	$5	$7	$10	$25	$50	$60

Enterprise.....25@25&7½%

Nos.	5	10	12	22	32
Each	$2	$3	$2.75	$4.50	$6

Dixon's,℔ doz.....30&10@40%

Nos.	1	2	3	4
	$14.00	$17.00	$19.00	$30.00

Ideal.....44&10@50%
Little Giant, ℔ doz.....33⅓@40%

Nos.	305	310	312	320	322
	$35.00	$48.00	$44.00	$72.00	$68.00

N. E Food Choppers.....40%
New Triumph No. 605, ℔ doz. $24.00..
30&10@40%
Russwin Food No. 1, $24 00; No. 2, $27.00
45&10&10%
Woodruff's, ℔ doz.....30&10@40%

Nos.	100	150
	$15.00	$18.00

Enterprise Beef Shavers.....25@30%

Slaw and Kraut—

Henry Disston & Sons:
Slaw, Corn Grater, &c.....40%
Kraut Cutters 24 x 7, 26 x 8, 30 x 9.55%
Kraut Cutters 36 x 12, 40 x 12.....40%
J. M. Mast Mfg. Co.:
Slaw Cutters, 1 Knife.....℔ doz. $3.00
Combined Slaw Cutter and Corn Grater.....℔ doz. $4.00
Tucker & Dorsey Mfg. Co.:
Kraut Cutters.....40%
Slaw Cutters, 1 Knife, ℔ gr....$18@$20
Slaw Cutters, 2 Knife, ℔ gr....$22@$36

Tobacco—

All Iron, Cheap.....*doz. $4.25@$4.50*
Enterprise.....25@50%
National,℔ doz. No. 1, $21; No. 2, $18..40%
Sargent's, ℔ doz., No. 2.....60%
Sargent's No 12 and 21.....5%&10%

Washer—

Appleton's, ℔ doz. $16.00.....50&10&10%

Diggers, Post Hole, &c.—

Dalbey Post Hole Auger...per doz., $9.00
Iwan's Improved Post Hole Auger.40&5%
Iwan's Vaughan Pattern Post Hole Augers,℔ doz.....$6.25
Iwan's Perfection Post Hole Digger...
℔ doz. $8.25
Iwan's Split Handle Post Hole Diggers,
℔ doz.....$7.25
Kohler's Universal.....℔ doz. $15.00
Kohler's Little Giant.....℔ doz. $12.00
Kohler's Hercules.....℔ doz. $10 00
Kohler's Invincible.....℔ doz. $9 00
Kohler's Rival.....℔ doz. $8.00
Kohler's Pioneer.....℔ doz. $7.20
Never-Break Post Hole Diggers, ℔ doz. $24.00.....60%
Samson,℔ doz. $34.00.....25%

Dividers—See *Compasses.*

Doors Screen—

Phillips', style E, 7x5 in.....℔ doz. $10.50
Phillips', style 077, 7x5 in.....℔ doz. $8.03
Phillips', style x-y, 7x5 in.....℔ doz. $11.00

Drawers. Money—

Tucker's Pat. Alarm Till No. 1,℔ doz. $18; No. 2, $15; No. 3, $1 . . 1 8

Drawing Knives—
See *Knives, Drawing.*

Dressers, Emery Wheel—

Diamond Emery Wheel Dressers.....35%
Diamond Wheel Dresser Cutters.....35%

Drills and Drill Stocks—

Common Blacksmiths' Drill...each
$1.50@$1.75
Breast, Millers Falls.....15&10%
Breast, P. S. & W.....40&5%
Goodell Automatic Drills..40&5@40&10%
Johnson's Automatic Drills Nos. 2 and 3.....16⅔%
Johnson's Drill Points.....16⅔%
Millers Falls Automatic Drills...33⅓&10%
Ratchet, Curtis & Curtis.....25%
Ratchet, Parker's.....40%
Ratchet, Weston's.....33⅓%
Ratchet, Whitney's, P. S. & W.....50%
Whitney's Hand Drill, No. 1, $10.00;
Adjustable, No. 10, $12.00.....33⅓%

Twist Drills—

Bit Stock.....60¢10@60¢10¢10%
Taper and Straight Shank.....
60¢10@60¢10¢5%

Drivers, Screw—

Screw Driver Bits..per doz. ..45@60c
Baisey's Screw Holder and Driver, ℔ doz. 2½-inch, $6; 4-in., $7.50 6-in., $9..40%
Buck Bros' Screw Driver Bits.....30%
Champion.....50%
Edson.....60%
Fray's Hol. H'dle Sets, No. 3, $12.00 50%
Gay's Double Action Ratchet.....35%
Goodell's Auto50&10&10@50&10&10&5%
Hurwood.....40%
Mayhew's Black Handle.....40%
Mayhew's Monarch.....40&10%
Millers Falls, Nos. 20 and 21.....25&10%
Millers Falls, Nos. 11, 12, 41, 42.....15&10%
Never Turn.....60%
New England Specialty Co.....50%
Sargent & Co.'s:
Nos. 1 and 60.....50&10&10%
Nos. 50 and 55.....60&10%
Nos. 20 and 40.....70&10%
Smith & Hemenway Co.....40&5%
H. D. Smith & Co.'s, Perfect Handle...40%
Stanley R. & L. Co.'s:
No. 64, Varnished Handles30@60&10&10%
No. 86.....70@70&10&10%
Swan's:
Nos. 65 to 68.....50%
No. 40.....40&10%
Nos. 25, 35 and 45.....30&10&10%

Eave Trough, Galvanized

Territory.	*L. C. L.*
A. Eastern.....	*80¢10¢5%*
B. Eastern.....	*80¢10¢10%*
Central.....	*80¢10¢5%*
Southern.....	*80%*
S. Western.....	*75¢10¢10%*

Terms, 2% for cash. Factory shipments generally delivered.
See also *Conductor Pipe and Elbows.*

Elbows and Shoes—

Factory shipments:
*Plain Rd., and Cor., 2, 3, and 4in*75%
Plain Rd., and Cor., 5 and 6in..60%
Perfect Elbows (S. S. & Co.).....40%

Emery, Turkish—

	4to16	5to150	Flour
Kegs.....*lb.*	5c	5½c	3½c
½ Kegs.....*lb.*	5¼c	5¾c	3¾c
Kegs.....*lb*	5c	6c	
10-lb cans. 10 in case	6½c	7c	6c
10-lb. cans, less than 10.	10c	10c	8c

NOTE.—*In lots 1 to 3 tons a discount of 10% is given.*

Extractors, Lemon Juice
—*See Squeezers, Lemon.*

Fasteners, Blind—

Zimmerman's.....50&10%
Walling's.....45%

Cord and Weight—

Ives.....40%

Faucets—

Cork Lined.....50@50&10%
*Metallic K. & Leather Lined*70@70&10%
Red Cedar.....40@40&10%
Petroleum.....70¢10@75%
B. & L. B. Co.:
Metal Key.....60&10%
Star.....60%
West Lock.....50&10%
John Sommer's Peerless Tin Key.... 40%
John Sommer's Boss Tin Key.....50%
John Sommer's Victor Metal Key.50&10%
John Sommer's Duplex Metal Key....60%
John Sommer's Diamond Lock.....40%
John Sommer's I. X. L. Cork Lined...50%
John Sommer's Reliable Cork Lined 50&10%
John Sommer's Chicago Cork Lined..60%
John Sommer's O. K. Cork Lined.....50%
John Sommer's No Brand, Cedar.....50%
John Sommer's Perfection Cedar....40%
McKenna, Brass:
Burglar Proof, N. P.....25%
Improved, ¼ and ⅜ inch.....25%
Self Measuring:
Enterprise, ℔ doz. $30.00.....40&10%
Lane's, ℔ doz. $36.00.....40&10%
National Measuring, ℔ doz. $36..40&10%

Felloe Plates—
See *Plates, Felloe.*

Files—Domestic—
List revised Nov. 1, 1899.
Best Brands.....70¢10@75¢5%
Standard Brands.75¢10@75¢10&10%
Lower Grade.....75¢10¢10@80¢10%

Imported—
Stubs' Tapers. Stubs' list, July 24, '97.....30%

Fixtures, Fire Door—

Richards Mfg. Co.:
Universal No. 103.....$4.00
Special No. 104.....$4.00
Fusible Links.....$0.25
Expansion Bolts.....50&10%

Grindstone—

Net Prices:

Inch....	15	17	19	21	24
Per doz.	$2.15	2.85	3.25	3.75	4.50

P., S. & W. Co.....30&10@40%
Reading Hardware Co.....60%
Sargent's.....70%
Stowell's Giant Grindstone Hanger ... ℔ doz. $6.00
Stowell's Grindstone Fixtures, Extra Heavy.....50&10&10%
Stowell's Grindstone Fixtures Light... 60&10%

Fodder Squeezers—
See *Compressors.*

Forks—

Base Discounts Aug. 1, 1899, list:
Hay, 2 tine ..... 50&10c&5%
Boys' & Fish, 2 tine ..... 50&10c&5%
Hay & Boys', 3 tine ..... 60&5%
Hay & Boys', 4 tine 66⅔%
Champion Hay 66⅔%
Hay & Header, long 3 tine 6
Header, 4 tine 65%
Barley, 4 & 5 tine, Steel ..... 60&20%
Manure, 4 tine ..... 60&15&2½%
Manure, 5 and 6 tine ..... 66⅔&c&2½%
Spading ..... 70&2½%
Potato Digger, 6 tine ..... 60&10%
Sugar Beet ..... 40&10%
Coke & Coal ..... 40&10%
Heavy Mill & Street 65%
Iowa Dig-Eay Potato ..... 60&10%
Victor, Hay ..... 60&15&2½%
Victor, Manure 66⅔%
Victor, Header 65%
Champion, Hay 66⅔%
Champion Header 65%
Champion, Manure ..... 60&15&2½%
Columbia, Hay ..... 60&20%
Columbia, Manure 70%
Columbia, Spading ..... 70&12½%
Hawkeye Wood Barley 40%
W. & C. Potato Digger ..... 60&10%
Acme Hay ..... 60&20%
Acme Manure, 4 tine ..... 60&10&5%
Dakota Header ..... 60&20%
Jackson Steel Barley ..... 60&20%
Kansas Header 65%
W. & C. Favorite Wood Barley 40%
Plated,—See *Spoons.*

Frames—Saw—

White, Straight Bar, per doz. 75@80c
Red, Straight Bar, per doz $1.00@$1.25
Red, Double Brace, per doz. $1.40@1.50

Freezers Ice Cream—

Qt.	1	2	3	4	6
Each	$1.25	$1.60	$1.90	$2.20	$2.80

Fruit and Jelly Presses—

See *Presses, Fruit and Jelly.*

Fry Pans—See *Pans, Fry.*

Fuse—

Per 1000 Feet.
Hemp $2.75
Cotton 3.20
Waterproof Single Taped 3.65
Waterproof Double Taped 4.40
Waterproof Triple Taped 5.15
10&2½%

Gates Molasses and Oil—

Stebbins' Pattern ..... 80&10@80&10c&5%

Gauges—

Marking, Mortise, &c. ..... 50&10c&5@50&10c10c&5%
Chapin-Stephens Co.:
Marking, Mortise, etc. ..... 50&10@50&10&10%
Scholl's Patent ..... 50&10@50&10&10%
Door Hangers ..... 5%@50&10%
Stanley R. & L. Co.'s Butt & Babbet Gauge ..... 20@20&10&10%
Wire, Brown & Sharpe's 25%
Wire, Morse's 25%
Wire P., S. & W. Co ..... 30&10%

Gimlets—Single Cut—

Nail, Metal, Assorted, gro. $1.40@1.50
Spike, Metal, Assorted gro. $2.80@3.50
Nail, Wood Handled, Assorted, gro. $1.75@2.00
Spike, Wood Handled, Assorted gro. $4.25@4.50

Glass, American Window

See *Trade Report*

Glasses, Level—

Chapin-Stephens Co ..... 60@60&10&10%

Glue—Liquid Fish—

Bottles or Cans, with Brush ..... 25@50%
Cans (¼ pts., pts., qts., ½ gal., gal.) ..... 25@48%
International Glue Co. (Martin's) ..... 40&10%

Grease Axle—

Common Grade ..... *gro.* $4.50@5.50
Dixon's Everlasting ..... 10-lb pails, ea. 85¢
Dixon's Everlasting, in bxs., ₱ doz. 1 lb $1.20; 2 lb $2.00

Grips, Nipple—

Perfect Nipple Grips ..... 40&10&2%

Griddles, Soapstone—

Pike Mfg. Co ..... 33⅓&@33⅓&10%

Grindstones—

Bicycle Emery Grinder $6.50
Bicycle Grindstones, each ..... $2.50@3.00
Pike Mfg. Co:
Improved Family Grindstones, per inch, per doz. ..... $2.00 } 33⅓%
Pike Mowe Knife and Tool Grinder, each ..... $6.00 }
Velox Ball Bearing, mounted, Angle Iron Frames ..... each, $3.25

Halters and Ties—

Covert Mfg. Co.:
Web 45%
Jute Rope ..... 50&5%
Sisal Rope ..... 35&5%
Cotton Rope ..... 45&5%
Hemp Rope ..... 45&2%
Covert's Saddlery Works:
Web and Leather Halters 70%
Jute and Manila Rope Halters 70%
Sisal Rope Halters ..... 70&20%
Jute, Manila and Cotton Rope Ties 70%
Sisal Rope Ties ..... 60&10%

Hammers—Handled Hammers—

Heller's Machinists' ..... 40&10@40&10&10%
Heller's Farriers ..... 40&10@40&10&10%
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50, $1.75 ..... 40@40&10&10%
Peck, Stow & Wilcox ..... 40&10&5%
Fayette R. Plumb:
Plumb, A. E. Nail ..... 33⅓&7½&@33⅓&10&7½%
Engineers' and B. S. Hand ..... 50&7½&5@50&10&7½&5%
Machinists' Hammers ..... 50&5@50&10&5%
Riveting and Tinners' ..... 40&2½&@40&10&2½%
Sargent's C. S. New List 40%

Heavy Hammers and Sledges—

Under 3 lb., per lb. 80c...90&10c&10@85%
3 to 5 lb ...per lb 40c...80&10c&10@85%
Over 5 lb...per lb. 30c..... 85@85c&10%
Wilkinson's Smiths' ..... 9½c@10c lb.

Handles—Agricultural Tool Handles—

Axe, Pick, &c. 60%
Hoe, Rake, &c. ..... 45@50c&5%
Fork, Shovel, Spade, &c.:
Long Handles ..... 45@5½&5%
D Handles 50%

Cross-Cut Saw Handles—

Atkins' ..... 40&5%
Champion ..... 45@45&10%
Disston's 50%

Mechanics' Tool Handles—

Auger, assorted ..... *gro* $2.50@$2 85
Brad Awl ..... *gro.* $1.65@$1 85
Chisel Handles:
Apple Tanged Firmer, gro. ass'd. $2.40@$2.65
Hickory Tanged Firmer, gro. ass'd. $2 15@$2.40
Apple Socket Firmer, gro. ass'd. $1 75@$1.95
Hickory Socket Firmer, gro. ass'd. $1.45 @ $1.60
Hickory Socket Framing, gro. ass'd. $1.60@$1.75
File, assorted ..... *gro.* $1.30@$1.40
Hammer, Hatchet, Axe, &c ..... 60@60&10
Hand Saw, Varnished, doz .80@85c
Not Varnished ..... 65@75c
Plane Handles:
Jack, doz. 80c; *Jack Botted* 75c
Fore, doz. ....45c; *Fore, Bolted* 90c
Chapin-Stephens Co.:
Carving Tool ..... 40@40&10%
Chisel ..... 65@65&10%
File and Awl ..... 65@65&10%
Saw and Plane ..... 40@40&10%
Screw Driver ..... 40@40&10%
Millers Falls Adj. and Ratchet Auger Handles ..... 15&10%
Nicholson Simplicity File Handle, ₱ gro ..... $0.85@$1.50

Hangers—

NOTE.—*Barn Door Hangers are generally quoted per pair, without track, and Parlor Door Hangers per double set with track, &c.*
Barn Door, New Pattern, Round Groove, Regular:

Inch	3	4	5	6	8
Single Doz.	$0.90	1.25	1.60	1.95	2.50

Barn Door, New England Pattern, Check Back, Regular:

Inch	3	4	5	6
Single Doz.	$1.50	1.85	2.50	3.00

Allith Mfg. Co.
Reliable No. 1 ..... per. doz. $8.00
Reliable No. 2 ..... per. doz. $9.60
Chicago Spring Butt Co.:
Friction 25%
Oscillating 25%
Big Twin 25%
Chisholm & Moore Mfg. Co.:
Baggage Car Door 50%
Elevator 30%
Railroad 50%
Cronk & Carrier Mfg. Co.:
Loose Axle ..... 60&10&5%
Roller Bearing ..... 70&5%
Griffin Mfg. Co:
Solid Axle, No. 10, $12.00 ..... 70%
Roller Bearing, No. 11, $18.00 ..... 70%
Roller Bearing, Ex. Hy., No. 22, $18.00 ..... 70%
Hinged Hangers $16.00 ..... 60&10%
Lane Bros. Co.:
Parlor, Ball Bearing $4.00
Parlor, Standard $3.15
Parlor, No. 105 ..... $2.85
Parlor, New Model $2.80
Parlor New Champion $2.25
Barn Door, Standard ..... 60&10&2½%
Hinged ..... net $6.40
Covered ..... 60&10%
Special ..... 70&5%
Lawrence Bros.:
Advance ..... 50&10%
Cleveland ..... 60&5%
Clipper, No. 75 ..... 60%
Crown ..... 60&10%
Easy Parlor Door, Dbl. Sets, $2.50; Single Sets, $1 25.
Giant ..... 60&5%
Hummer ..... 70&5
New York ..... 60&10%
Peerless ..... 70&5%
Sterling ..... 60&10%
McKinney Mfg. Co.:
No. 1, Special, $15 ..... 60&10%
No. 2, Standard, $18 ..... 60&10%
Hinged Hangers, $16 ..... 50%
Meyers' Stayon Hangers 60%
Richards Mfg. Co.:
Pioneer Wood Track No. 3 ..... $2.15
Ball B'r'g Steel Track No. 10 ..... $2.40
Roller B'r'g Steel Track No. 12 ..... $2.30
Ball B'r'g Steel Track No. 13 ..... $2.40
Roller B'r'g Steel Track No. 14 ..... $2.30
Hero Adjustable Track No. 19 ..... 50%
Adjustable Track Tandem Trolley Track No. 16 ..... 50%
Seal, Steel Track No. 8 ..... $2.40
Auto Adjustable Track No. 22, 40&10%
Trolley B. D. No. 17 ..... $1.40
Trolley F. D. No. 120 ..... $2.85
Trolley F. D. No. 121 ..... $2.45
Trolley F. D. No. 151 ..... $2.60
Safety Underwriters F. D. No. 101 ..... $2.25
Tandem No. 44 ..... 70&5%
Trolley F. D. No. 151 ..... $3.00
Palace, Adjustable Track No. 132 ..... 40&10%
Rural, Adjustable Track No. 132 ..... 40&10%
Ives' Wood Track No. 1 ..... $2.15
Trolley B. D. No. 20 ..... $1.45
Trolley B. D. No. 24 ..... $1.45
Trolley B. D. No. 27 ..... $1.5
Trolley B. D. No. 28 ..... $1.66
Roller Bearings Nos. 39, 40, 41, 43, 44 ..... 70&5%
Anti-friction No. 42 ..... 60&10%
Hinged Tandem No. 48 ..... 60%
Folding Door B. B. Swivel No. 125, 50%
Safety Door Hanger Co.:
Storm King Safety 60%
U. S. Standard Hinge 60%
Stowell Mfg. and Foundry Co.
Acme Parlor Ball Bearing 10%
Ajax Hinge Door 60%
Apex Parlor Door ..... 50&10&5%
Atlas 60%
Bargake ar Door 30%
Climax Anti-Friction ..... 50&10%
Elevator 40%
Express 30%
Freight Car Door 60%
Interstate ..... 40&10%
Lundy Parlor Door ..... 50&10%
Magic 60%
Matchless ..... 60&10%
Nansen ..... 70&5%
Parlor Door ..... 50&10%
Railroad ..... 50&10%
Rex Hinge Door 60%
Street Car Door 50%
Steel, Nos. 300, 404, 500 ..... 50&10%
Underwriter's Fire Door 40%
Wild West Warehouse Door ..... 5 %
Zenith for Wood Track ..... 50&10%
A. L. Swett Iron Works:
Check Back 70%
Climax Anti-Friction ..... 50&10%
Eagle 70%
Hylo Hinge 60%
New Perfection 60%
Pilot 60%
Pilot Hinge 60%
Rider Wooster 65%
Western Pattern 70%
Taylor & Boggis Fly Co.'s Kidder's Roller Bearing ..... 50&15&10&5%
Wilcox Mfg. Co.:
Bike Roller Bearing ..... 60&10%
C. J. Roller Bearing ..... 60&10%
Cycle Ball Bearing 50%
Dwarf Ball Bearing 40%
Ives, Wood Track ..... 60&10%
L. T. Roller Bearing ..... 60&10&5%
New Era Roller Bearing ..... 50&10%
O. K. Roller Bearing ..... 60&10&5%
Prindle, Wood Track 60%
Richards' Wood Track 60%
Richards' Steel Track ..... 50&10%
Spencer Roller Bearing ..... 60&10%
Tandem Nos. 1 and 2 ..... 40%
Underwriters' Roller Bearing 40%
Velvet 50%
Wilcox Auditorium Ball Bearing, 30%
Wilcox Barn Trolley No. 123 ..... 40%
Wilcox Elv. Door, Nos 112 and 123, 50%
Wilcox Elv. Door, No. 132 ..... 30%
Wilcox Fire Trolley, Roller Bearing 30%
Wilcox Le Roy Noiseless Ball Bearing 40%
Wilcox New Century ..... 50&10&10%
Wilcox O. K. Steel Track 50%
Wilcox O. K. Trolley 50%
Wilcox Trolley Ball Bearing 40%
Wilcox Wideman Narrow Gauge, Ball Bearing 40%
For Track, see *Rail*

Extra 5&10% often given.

Hangers, Garment—

Pullman Trouser, No. 1, ₱ gro $9.00
Pullman Trouser, No. 4, ₱ gro $24.00
Victor Folding ₱ gro $9.60
Western, W. G. Co ..... 50&10%

Gate—

Myers' Patent Gate Hangers, ₱ dozn et 4.80

Hasps—

McKinney's Perfect Hasp, ₱ doz 5%

Hatchets—

Regular list, first quality 40%
Second quality $1.00 *per doz. less than first quality.*

Heaters Carriage—

Clark, No 5, $1.75; No. 5B, $2.00; No 3, 2.25; No. 3D, $2.75; No. 7D, $3.00; No. 3E, $3.25; No. 1, $3.50 ..... 1%
Clark Coal, $0.75 ₱ doz 10%

Hinges—Blind and Shutter Hinges—

Surface Gravity Locking Blind:
(Victor; National; 1868 O P Niagara; Clark's O. P.; Clark's Tip; Buffalo.)

No.	1	3	5
Doz pair	$0.85	1.75	3.50

Mortise Shutter:
(L. & P., O. S., Dixie, &c.)

No.	1	1½	2	2½
Doz. pair	$0.70	.65	.60	.55

Mortise Reversible Shutter, (Buffalo, &c.)

No.	1	1½	2
Doz. pair	$0.75	.70	.65

North's Automatic Blind Fixtures, No. 2, for Wood, $9.00; No. 3, for Brick, $11.50 ..... 10%
Parker ..... 70@75%
Reading's Gravity 40%
Sargent's, Nos. 1, 3, 5, 11 & 13 ..... 75%
Stanley's Steel Gravity Blind Hinges ₱ doz. sets, without screws, $0.90 with screws, $1.30.
Wrightsville H'dware Co.:
O. S., Lull & Porter ..... 75&5%
Acme, Lull & Porter 75%
Queen City Reversible 75%
Shepard's Noiseless, Nos. 60, 65, 55, 70 & 75%
Niagara, Gravity Locking, No. 1, 3 & 5 ..... 75%
1868, Old Pat'n, Nos. 1, 3 & 5 ..... 75%
Tip, Pat'n, Nos. 1, 3 & 5 ..... 75%
Buffalo Gravity Locking, Nos. 1, 3 & 5, 75%
Shepard's Double Locking, Nos. 20 & 25 ..... 70%
Champion Gravity Locking, No. 75, 75%
Steamboat Gravity Locking, No. 10, 75%
Pioneer, Nos. 060, 45 & 5½ 75%
Empire, Nos. 101 & 103 ..... 70%
W. H. Co.'s Mortise Gravity Locking, No. 2 ..... 60%

Gate Hinges—

Clark's or Shepard's—Doz. sets:

No.	1	2	3
Hinges with Latches	$2.00	2.70	5.00
Hinges only	$1.40	2.05	3.80
Latches only	.70	.70	.35

New England:
With Latch ..... doz .... @$2.00
Without Latch ..... doz. .... @$1.60
Reversible Self-Closing:
With Latch ..... doz. .... @$1.75
Without Latch ..... doz. .... @$1.35
Western:
With Latch ..... doz. $1.75
Without Latch ..... doz. $1.15
Wrightsville H'dware Co.:
Shepard's or Clark's, doz. sets,

No.	1	2	3
Hinges with Latches	$2.00	2.70	5.00
Hinges only	1.40	2.05	3.80
Latches only	.70	.70	1.35

Pivot Hinges—

Bommer Bros. Pivot 40%
Lawson Mfg. Co. Matchless 45%

Spring Hinges—

Holdback Cast Iron gro ...$9.00@9.50
Non-Holdback, Cast iron, gro. $8@8.50
J. Bardsley
Bardsley's Non-Checking Mortise Floor Hinges 45%
Bardsley's Patent Checking 15%
Bommer Bros.:
Bommer Ball Bring Floor Hinges 40%
Bommer Spring Hinges 40%
Chicago Spring Butt Co.:
Chicago Spring Hinges 25%
Triple End Spring Hinges 50%
Chicago (Ball Bearing) Floor Hinge 50%
Garden City Engine House 25%
Keene's Saloon Door 25%
Columbian Hdw. Co.:
Acme, Wrt. Steel 30%
Acme, Brass 25%
American 30%
Columbia, No. 14 ..... ₱ gr. $9.00
Columbia, No. 18 ..... ₱ gr. $25.00
Columbia, Adjustable, No. 7, ₱ gr. $12.00
Gem, new list 30%
Clover Leaf ..... ₱ gr. $12.50
Oxford, new list 30%
Lawson Mfg. Co. Matchless 30%
Richards Mfg. Co.:
Superior Double Acting Floor Hinges 40%
Shelby Spring Hinge Co:
Chief Ball Bearing Floor Hinge, 50%
Ohio Detachable Screen Door Hinge ₱ gro. $12.00
The Stover Mfg. Co.:
Ideal, No. 16, Detachable, ₱ gr $12.50
Ideal, No. 4 ..... ₱ gr. $9.00
New Idea No. 1 ..... ₱ gr. $9.00
New Idea, Double Acting 45%
New Idea Floor 45%
Van Wagoner:
Ball Bearing 25%
No. 777 Sh't Steel Holdh'k.. ₱ gro. pr. $9

Extra 10% often given on most of these Hinges.

Wrought Iron Hinges—

Strap and T Hinges, &c., list Mar 15, 1901:
Light Strap Hinges ..... 80&25%
Heavy Strap Hinges 80&20&10%
Light T Hinges ..... 75&10&5%
Heavy T Hinges ..... 75&5%
Extra Heavy T Hinges ..80&20%
Hinge Hasps 70%
Cor. Heavy Strap ....80&20&10%
Cor Ex. Heavy T ..... 80&20

Extra 3 or 5 less

Screw Hook and Strap. 6 to 12 in ..... lb. 3½c
14 to 20 in ..... lb. 3 c
22 to 36 in ..... lb. 2¾c
Screw Hook and Eye:
¾ to 1 inch ..... lb. 6 c
⅝ inch ..... lb. 7 c
½ inch ..... lb. 9 c

Hitchers, Stall—

Covert Mfg. Co. Stall Hitchers 35%

Hods, Coal—

	15	16	17	18 inch.
Galv. Open	$2.50	2.75	3.00	$ 25 ₱ doz.
Jap. Open	$1.90	2.10	2.25	2.55 ₱ doz.
Galv. Funnel	$3.00	3.30	3.60	3 90 ₱ doz.
Jap. Funnel	$2.45	2.65	2.85	3.30 ₱ doz.

Masons, Etc.—

Cleveland Wire Spring Co.:
Steel Mortar ..... each $1.45
Steel Brick ..... each $1.10

Hoes—Eye—

Scovil and Oval Pattern ..... 60c&10@60c&10c10%
Grub, list Feb. 23, 1899 70c&10@75c&10%
D. & H. Scovil 35%

Handled—

Aug. 1, 1899, List:
Field and Garden ..... 70c&10%
Smith's Patent 50%
Meadow & Rhode Island 75%
Black Diamond ..... 70c&10%
Mortar and Street ..... 70c&10c&10%
Planters' ..... 75c&12½&%
Cotton ..... 70c&10c&10%
Cotton Chopper ..... 75c&12½&%
Weeding Hoes ..... 66⅔&c&15%
Steel Weeders ..... 66⅔&c&15%
Malleable Weeders ..... 66⅔&c&15%
Ft. Madison Cotton Hoe ..... 70&10&10%
Ft. Madison Crescent Cultivator Hoe per doz ..... 70&10%
Ft. Madison Mattock Hoes:
Regular Weight ..... ₱ doz. 66⅔%
Junior Size ..... ₱ doz. $4.00
Ft. Madison Sprouting Hoe, ₱ doz. 50%
Ft. Madison Dixie Tobacco Hoe ..... 75&10&2½%
Kretsinger's Cut Easy ..... 70&10%
Warren Hoe ..... 45&10%
W. & C. Ivanhoe ..... 75&2%
B. B. 6 in., Cultivator Hoe $3.15
B. B., 6&10 ..... $3.85
Acme Weeding ..... ₱ doz. net, $4.35
W. & C. Lightning Shuffle Hoe, ₱ doz. $4.85

Hoisting Apparatus—

See *Machines, Hoisting.*

Holders—Bit—

Angular, ₱ doz. $24.00 ..... 45&10%

Door—

Empire 50%
Bardsley's 45%

File and Tool—

Nicholson File Holders and File Handles ..... 33⅓&@40%

Hooks—Cast Iron—

Bird Cage, Reading 60%
Bird Cage, Sargent's List ..... 60&10%
Ceiling, Sargent's List ..... 50&10&10%
Clothes Line, Reading List ..... 60&10%
Clothes Line, Sargent's List. 50&20&10%
Coat and Hat, Sargent's List ..... 50&10%
Clothes Line, Stowell's 70%
Coat and Hat, Reading ..... 45&20%
Coat and Hat, Stowell's 70%
Coat and Hat, Wrightsville 65%
Harness, Reading List ..... 60&5%
Harness, Stowell's 60%
School House, Stowell's 70%

Wire—

Belt ..... 80c—%
Wire C. & H. Hooks ....75c&5@75c&10%
Atlas, Coat and Hat:
Single Cases 75%
10 Case Lots ..... 75&10%
Columbian Hdw Co. Gem ..... 60&10%
Parker Wire Goods Co.: King ..... 75&10%
Van Wagoner, Coat and Hat 70%
Western W. G. Co. Molding 75%

Wire Goods Co.:
Acme ..... 60&10%
Chief 70%
Crown ..... 70&10%
Czar 65%
V Brace ..... 70&10%
Czar Harness ..... 50&10%

Wrought Iron—
Box, 6 in., per doz, $1.00; 8 in., $1.25; 10 in., $2.50.
Cotton ..... doz. $1.05@1.25
Wrought Staples, Hooks, &c.—
See *Wrought Goods.*

Miscellaneous—
Hooks, Hench, see *Stops, Bench.*
Bush, Light, doz. $4.75; Medium, $5.35; Heavy, $6.25
Grass ..... Nos. 1 2 3 4
Best $1.50 1.75 2.00
Common ... $1.30 1.50 1.50 1.60
Potato and Manure .... 60&15%
Wh fletres ..... lb. 5¾@6c
Hooks and Eyes:
Brass ..... 60&10&10@70%
Malleable Iron ..... 70&5@70&10%
Covert Mfg.Co,Gate and Scuttle Hooks 35%
Covert Saddlery Works' Self Locking Gate and Door Hook 60%
Ft. Madison Cut-Easy Corn Hooks, ₩ doz. $5.25 net
Bench Hooks—See *Bench Stops.*
Corn Hooks—See *Knives, Corn.*

Horse Nails—See *Nails, Horse*

Horseshoes—
See *Shoes, Horse.*

Hose Rubber—
Garden Hose, ¾-inch:
Competition ..... ft. 4½@ 5 c
3-ply Standard ..... ft. 6½@ 7 c
4-ply Standard ..... ft. 7½@ 8 c
3-ply extra ..... ft. 8½@ 9 c
4-ply extra ..... ft. 10 @10½c
Cotton Garden, ¾-in., coupled:
Low Grade ..... ft. 6 @7 c
Fair quality ..... ft. 8 @9 c

Irons—Sad—
From 4 to 10 ..... lb. 2¾@3 c
B. B. Sad Irons ..... lb. 3¼@3½c
Chinese Laundry ..... lb. 4¾@5c
Chinese Sad ..... lb. 4@4¼c
Mrs. Potts', cents per set:

	Nos.	50	55	60	65
	JapdTops	62	59	72	69
	TindTops	65	62	75	72

New England Pressing, lb.. 3¾@4c

Pinking—
Pinking Irons ..... doz. 50@60c

Soldering—
Soldering Coppers 2¼ and 3.. 19@20c
1¼ and 2 ..... 21@22c

Jacks Wagon—
Covert Mfg. Co.:
Auto Screw ..... 80&5%
Steel ..... 45&2%
Covert's Saddlery Works':
Daisy ..... 60&10%
Victor 60%
Lockport 50%
Lane's Steel ..... 30&10&5%
Richards' Tiger Steel, No. 130 ..... 40%

Kettles—
Brass, Spun, Plain ..... 20@25%
Enameled and Cast Iron—See *Ware, Hollow.*

Knives—Butcher, Kitchen, &c.—
Foster Bros.' Butcher, &c 30%
Smith & Hemenway Co ..... 40&10%
Wilkinson Shear & Cutlery Co,..... 50%

Corn—
Withington Acme, ₩ doz., $2.65; Dent, $2.75; Adj. Serrated, $2.20; Serrated, $2.10; Yankee No. 1, $1.50; Yankee No. 2, $1.15.

Drawing—
Standard List ..... 70&10@75&10%
C. E. Jennings & Co. Nos. 45, 46 ..... 60%
Jennings & Griffin, Nos. 41, 42 ..... 60%
Ohio Tool Co.'s 70%
Swan's ..... 70&10&2½%
Watrous 16⅔%
L. & I. J. White ..... 20&5@25%

Hay and Straw—
Iwan's Sickle Edge ..... ₩ doz. $9.50
Iwan's Serrated ..... ₩ doz. $10.00

Mincing—
Buffalo ..... ₩ gro. $13.00

Miscellaneous—
Farriers' ..... doz. $3.00@3.75
Wostenholm's ..... ₩ doz. $3.00@3.25

Knobs—
Base, 2¼-inch, Birch, or Maple, Rubber tip, gro ..... $1.10@1.15
Carriage, Jap, all sizes .. gro. 40@45c
Door, Mineral ..... doz. 65@70c
Door, Por. Jap'd ..... doz. 70@75c
Door, Por. Nickel .... doz. $2.05@2.15
Bardsley's Wood Door, Shutter, &c .. 15%
Picture, Sargent's ..... 60&10&10%

Lacing Leather—
See *Belting, Leather—*

Ladders, Store &c.—
Lane's Store 25%
Myers Noiseless Store Ladders 50%
Richards Mfg. Co.:
Improved Noiseless, No. 112 ..... 40%
Climax Shelf, No. 113 ..... 40%
Trolley, No. 109 ..... 40%

Ladles—Melting—
L. & G. Mfg. Co, Low List 25%
P. S. & W 50%
Reading 60%
Sargent's ..... 50&10%

Lanterns—Tubular—
Regular Tubular No. 0. doz. $4.35@4.75
Lift Tubular .. No. 0 .. doz. $4.75@5.25
Hinge Tubular. No. 0 .. doz. $4.75@5.25
Other Styles ..... 40&10@40&10&5%

Bull's Eye Police—
No. 1, 2¾ inch ..... $2.50@2.75
No. 2, 3 inch ..... $2.75@3.00

Lasts and Stands Shoe—
Stowell's Atlas, Malleable Iron 50%
Stowell's Badger, Cast Iron 50%

Latches—Thumb—
Roggin's Latches, with screw. doz 35@40c

Door—
Richards' Bull Dog, Heavy, No. 125 .... 40%
Richards' Trump, No. 127 ..... 50%

Leaders Cattle—
Small ..... doz. 55c; large, 60c
Covert Mfg. Co 35%

Lifters, Transom—
R & E 33⅓%

Lines—

Wire Clothes, Nos...	*13*	*19*	*20*
100 feet $2.20	*2.00*	*1.65*	
75 feet $1.80	*1.70*	*1.30*	

Samson Cordage Works:
Solid Braided Chalk, No. 0 to 3 ..... 40%
Silver Lake Braided Chalk, No. 0, $6.00; No. 1, $6.50; No. 2, $7.00; No. 3, $7.50 ₩ gr 20%
Masons' Lines, Shade Cord, &c.: White Cotton, No. 3½, $1.50; No. 4 $2.00; No 4½, $2.50; Colors, No. 3½, $1.75; No. 4, $2.25; No. 4½, $2.75; Linen, No. 3½ $2.50; No. 4, $3.50; No. 4½, $4.50 .... 20%
Tent and Awning Lines: No. 5, White Cotton, $7.50; Drab Cotton, $8.50. .... 20%
Clothes Lines, White Cotton: 50 ft., $2.75; 60 ft., $3.25; 70 ft., $3.75; 75 ft., $4.00; 80 ft., $4.25; 90 ft., $4.75; 100 ft., $5.25.. 20%
Anniston Waterproof Clothes, 50 ft., ₩ gro., $34.00; Gilt Edge, $22.00; Air Line $22.00; Acme, $17.00; Alabama, $15 00; Empire, $14.00; Advance, $18.50; Oriole, $20.00; Albermarle, $13.50; Eclipse, $12.50; Chicago, $11.00 Standard $10.00; Columbia, $8.50; Allston, Calhoun, $11.00.

Locks—Cabinet—
Cabinet Locks ..... 33⅓@33⅓&7½%

Door Locks, Latches, &c.—
[Net prices are very often made on these goods.]
Reading Hardware Co ..... 45&20%
R. & E. Mfg. Co 40%
Sargent & Co ..... 40&10%
Stowell's Steel Door Latches 50%

Elevator—
Stowell's 50%

Padlocks—
Wrought Iron ..... 75&10&5@80&5%
R. & E. Mfg. Co. Wrt. Steel and Brass. 75@75&10%

Sash, &c.—
Ives' Patent.:
Bronze and Brass 62½%
Crescent ..... 50&10%
Iron 62½%
Window Ventilating 60%
Robison Patent Ventilating Sash Lock 40%
Wrought Bronze and Brass 55%
Wrought Steel 55%
Pullman Patent Ventilating Lock 25%
Reading 60%

Machines—Boring—
Com. Upright, Without Augers .. $3.00
Com. Angular, Without Augers .. $3.25

	Without Augers.	
R. & E. Mfg. Co.:	Upright.	Angular.
Improved No. 3	$4.25	No. 1 $5.00
Improved No. 4	3.75	No. 2 3.38
Improved No. 5	2.75	

Jennings'.. Nos. 1 and 4 ..... 35&5%
Millers' Falls 5.75
Snell's, Rice's Pat. 2.50 2.75

Corking—
Reisinger Invincible Hand Power ..... ₩ doz. $48.00

Fence—
Williams Fence Machines ..... each, $5.50

Hoisting—
Moore's Anti-Friction Differential Pulley Block 30%
Moore's Hand Hoist, with Look Brake. 20%

Ice Cutting—
Chandler's 12½%

Washing—

Boss Washing Machine Co.:	Per doz.
Champion Rotary .Banner No. 1	$54.00
Standard Champion No. 1	$48.00
Standard Perfection	$36.00
Cinti Square Western	$30.00
Uneeda American, Round	$29.00

Mallets—
Hickory ..... 45&5@50%
Lignumvitæ ..... 45&5@50%
Tinners', Hickory and Applewood, doz ..... 50@55c

Mangers, Stable—
Swett Iron Works 50%

Mashers, Vegetable—
Western, W. G. Co., Potato ..... 60&10%

Mats—Door—
Elastic Steel (W.G. Co.) 10%

Mattocks—
See *Picks and Mattocks.*

Milk Cans—See *Cans, Milk*

Mills—Coffee, etc.—
Enterprise Mfg. Co ..... 25@30%
National list Jan. 1, 1902 ..... 30%
Parker's Columbia & Victoria. 50&10@60%
Parker's Box and Side ..... 50&10@60%
Swift, Lane Bros Co 30%

Mowers, Lawn—
Net prices are generally quoted.
Cheap ..... all sizes. $1.75@2.00
Good ..... all sizes, $2.25@2.50

	10	*12*	*14*	*16-inch*
High Grade	*4.25*	*4.50*	*4.75*	*5.00*

Continental ..... 60&5%
Great American 70%
Great American Ball Bearing, new list. 70%
Quaker City 70%
Pennsylvania ..... 60&5%
Pennsylvania, Jr., Ball Bearing 60%
Pennsylvania Golf 50%
Pennsylvania Horse ..... 33⅓&5%
Pennsylvania Pony ..... 40&5%
Philadelphia:
Styles M., S., C., K. T ..... 70&5%
Style A, all Steel ..... 60&5%
Style E, High Wheel ..... 70&10&5%
Drexel and Gold Coin, special list 50%

Nails—
Wire Nails and Brads, Papered, List July 20, 1899 ..... 90@90&10%
Cut and Wire. See Trade Report. Hungarian, Finishing, Upholsterers', &c. See Tacks.

Horse—

Nos.	6	7	8	9	10	
Anchor	23	21	20	19	18	..... 40&5%
Champ'in	26	26	25	24	23	..... 50%
Coleman	13	13	13	11	11	..... net
New Haven	23	21	20	19	18	..... 40&5%
Putnam	23	21	20	19	18	..... 33⅓%
New P'tn'm	19	18	17	16	16	..... 10&10%
Western, per lb						..... 8½¢

Jobbers' special brands, per lb. 8@8½¢

Picture—

	1¼	*2*	*2¼*	*3*	*3½ in.*
Brass Head	*.45*	*.60*	*.70*	*.95*	*1.00 gro.*
Por. Head	*..*	*1.10*	*1.10*	*1.10*	*.. gro.*

Nippers, See *Pliers and Nippers.*

Nuts—
Cold Punched: Off list.
Mfrs. or U. S. Standard.
Square, plain $5.10
Hexagon, plain $5.60
Square, C. T. & R $5.30
Hexagon, C. T. & R $6.00
Hot Pressed:
Mfrs., U. S. or Nar. Gauge Stan'd.
Square Blank $5 80
Hexagon Blank $6.30
Square Tapped $5 80
Hexagon Tapped $6 30

Oakum—
Best or Government ..... lb. 6½c
Navy ..... lb. 5 c
U. S. Navy ..... lb. 6 c
Plumbers' Spun Oakum 2½c
In carload lots ¼c lb. off f.o.b. New York.

Oil Tanks—See *Tanks, Oil.*

Oilers—
Brass and Copper ..... 50&10%
Tin or Steel ..... 65&10%
Zinc ..... 65&10%
Chase or Paragon:
Brass and Copper ..... 45&10@50%
Tin or Steel ..... 65&10%
Zinc ..... 65&10%
Malleable, Hammers' Improved, No. 1, $3.60; No. 2, $4; No. 3, $4.40 ₩ doz. 20%
Malleable, Hammers' Old Pattern, same list ..... 50&10%
American Tube & Stamping Co.:
Spring Bottom Cans ..... 70@70&10%
Railroad Oilers etc ..... 60@60&10%

Openers—Can—
French ..... doz. 55c
Iron Handle ..... doz. 25@37c
Sprague, Iron Hdle., per doz. 35@50c
Sardine Scissors .. doz. $1.75@$3.00
National 50%
Stowell's Sprague ..... per doz. 35@45c

Egg—
Nickel Plate ..... per doz., $2.00
Silver Plate ..... per doz., $4.00

Packing—
Asbestos Packing, Wick and Rope, 14½@15c lb.

Rubber—
Sheet, C. I ..... 8@10c
Sheet, C. O. S ..... 9@13c
Sheet, C. B. S ..... 10@14c
Sheet, Pure Gum ..... 50@65c
Sheet, Red ..... 40@50c
Jenkins' '96, ₩ lb 80 ..... 25@25&5%

Miscellaneous—
American Packing ..... 7@10c lb.
Cotton Packing ..... 16@25c lb.
Italian Packing ..... 9@12½c lb.
Jute ..... 4@4½c lb.
Russia Packing ..... 8@11c lb.

Pails—Creamery
S. S. & Co., with gauges.. No 1 $6.25; No. 2, $5.50 ₩ doz.

Pails, Water, Well, &c.—
See *Buckets*

Pans—Dripping—
Standard List ..... 60c10@60&10c&5%

Fry—
Common Lipped:

No.	*1*	*2*	*3*	*4*	*5*
Per doz.	*$0.75*	*0.80*	*0.90*	*1.10*	*1.30*

Refrigerator, Galv.

Inch	*12*	*14*	*16*	*18*
Per. doz.	*$1.95*	*2.25*	*2.80*	*3.15*

Roasting and Baking—
Regal, S. S. & Co., ₩ doz., Nos. 5, $4.50; 10 $5.25; 20, $5.75; 30, $6.25.
Savory, ₩ doz., net, Nos. 200, $9.00; 4.00, $15.00.
Simplex, ₩ gro.:

No.	40	50	60	140	150	160
	$30.00	35.0	42.00	31.00	39.00	46.00

Paper—Building Paper—

Asbestos:	*lb.*
Building Felt 2¾c	
Mill Board, sheet, 40 x 40 inches 3½c	
Mill Board, roll, thicker than 1-16 inch 3½c	
Mill Board, roll, 1-16 in. thick and less 2½c	
	Per roll
Rosin Sized Sheathing: 500 sq. ft.	
Light wt., 25 lbs. to roll .. $0.40@0.45	
Medium wt., 30 lbs. to roll. $0.45@0.50	
Heavy wt., 40 lbs. to roll .. $0.65@0.70	
Black Water Proof Sheathing, 500 Sq ft., 1 ply, 64c; 2 ply, 85c; 3 ply, $1.10; 4 ply, $1.25.	
Deafening Felt, 2, 3 and 4¼ sq. ft. to lb., ton $41.00	
Red Rope Roofing, 250 sq. feet per roll $1.75	

NOTE.—*These goods are often sold at delivered prices.*

Tarred Paper.
1 ply (roll 200 sq. ft.), ton .. $32.50@35.50
2 ply, roll 108 sq. ft ..... 55@60c
3 ply, roll 108 sq. ft ..... 78@80c
Slater's Felt (roll 100 sq. ft.) 75c

NOTE.—*Above prices often include delivery, and are for Eastern territory, where prices are controlled by agreement between the manufacturers. In open territory much lower prices are current.*

R. R. M. Stone Surfaced Roofing (roll 110 sq. ft.) $2.75

Sand and Emery—
Flint Paver and Cloth .. 50&10@60%
Garnet Paper and Cloth 25%
Emery Paper and Cloth .. 50&10@60%

Parers—Apple—
Advance ..... ₩ doz. $4.00
Baldwin ..... ₩ doz. $4.00
Bonanza Improved ..... each $6.50
Daisy ..... ₩ doz $4.00
Dandy ..... each $7.50
Eureka Improved ..... each $20.00
Family Bay State ..... ₩ doz. $15.00
Improved Bay State ..... ₩ doz. $36.00
Little Star ..... ₩ doz. $5 00
New Lightning ..... ₩ doz. $7.00
Reading 72 ..... ₩ doz. $3.25
Reading 78 ..... ₩ doz. $6.25
Rocking Table ..... ₩ doz. $6.20
Turn Table '98 ..... ₩ doz. $6.00
White Mountain ..... ₩ doz. $5.00

Potato—
Saratoga ..... ₩ doz. $7.00
White Mountain ..... ₩ doz. $6 00

Picks and Mattocks—
List Feb. 25, 1899 ..... 70&10@75&10%

Pinking Irons—
See *Irons, Pinking.*

Pins—Escutcheon—
Brass ..... 60@60&10%
Iron, list Nov. 11, '85 ..... 60@60&10%

Pipe, Cast Iron Soil—
Standard, 2-6 in ..... 50&10
Extra Heavy, 2-6 in 65%
Fittings 70%

Pipe, Merchant.
Carload Lots,

	Steel.		*Iron.*	
	Blk.	*Galv*	*Blk*	*Galv.*
⅛ and ¼-inch	*71%*	*55%*	*69%*	*53%*
⅜ and ½-inch	*75%*	*63%*	*73%*	*61%*
¾ to 6 inch	*79%*	*69%*	*77½%*	*67½%*
7 to 12 inch	*74%*	*59%*	*72½%*	*57%*

Pipe, Sewer—
Jobbers' Prices—
Standard Pipe and Fittings, 2 to 24 in.
New England 67%
New York and New Jersey 70%
Maryland, Delaware, East Penn. 72%
West Penn and West Va 75%
Virginia 75%
Ohio, Michigan and Ky 75%
Indiana 77%
Carload lots are generally delivered.

Pipe, Stove—
Edwards' Nested Stove Pipe:

	C. L.	L. C. L.
5 in., per 100 joints	$7.00	$8 00
6 in., per 100 joints	7.50	8.50
7 in., per 100 joints	8.50	9.50

Planes and Plane Irons—Wood Planes—
Bench, First quality .. 40&5@40&10%
Bench, Second qual .. 50&5@50&10%
Molding ..... 33⅓&5@33⅓&10%
Bailey's (Stanley R. & L. Co) 5&10@25&10&10%
Chapin-Stephens Co.:
Bench, First Quality ..... 40@40&10%
Bench, Second Quality ..... 50@50&10%
Molding ..... 33⅓@33⅓&10%
Toy and German ..... 40@40&10%
Chaplin's 60%
Ohio Tool Co.:
Bench, First Quality ..... 40@40&10%
Bench, Second Quality ..... 50@50&10%
Molding ..... 33⅓@33⅓&10%
Adjustable Wood Bottom 60%
Union 60%

Iron Planes—
Bailey's (Stanley R. & L. Co) ..... 25&10@25&10&10%
Chaplin's Iron Planes ..... 50&10%
Miscellaneous Planes (Stanley R. & L. Co.) ..... 20&10@20&10&10%
Ohio Tool Co.'s Iron Planes 40%
Sargent's ..... 50&10%
Union 60%

Plane Irons—
Wood Bench Plane Irons ..... 30@35&30@35&10%
Buck Bros 30%
Chapin-Stephens Co ..... 30@30&10%
Ohio Tool Co 30%
Stanley R. & L. Co .. 20&10@20&10&10%
Union 50%
L. & I. J. White ..... 20&5@25%

Planters, Corn, Hand.
Kohler's Eclipse ..... ₩ doz. $8.50

Plates—
Felloe ..... lb 3¾@4c
Self-Sealing Pie Plates (S. S. & Co.), ₩ doz. $2.00 ..... 50%

Pliers and Nippers—
Button Pliers ..... 75&10@80%
Gas Burner, per doz., 5 in., $1.25@ $1.50; 6 in., $1.45@$1.50
Gas Pipe .. 7 8 10 12-in.
$2.00 $2.25 $3.00 $3.75
Acme Nippers ..... 50&50&5%
Cronk & Carrier Mfg. Co.:
American Button ..... 75&10%
Cronk's 60%
Improved Button ..... 60&10%
Stub's Pattern 50%
Combination and others 33⅓%
Haller's Farriers' Nippers, Pincers, and Tools 40&10@40&10&10%
P., S. & W. Tinners Cutting Nippers, 30@30&10%
Swedish Side, End and Diagonal Cutting Pliers 50%
Utica Drop Forge & Tool Co.:
Pliers and Nippers, all kinds 40%

Plumbs and Levels—
Chapin Stephens Co.:
Plumbs and Levels ..... 30@30&10&10%
Chapin's Imp. Brass Cor ..... 40@40&10&10%
Pocket Levels ..... 30@30&10&10%
Disston's Plumbs and Levels 70%
Disston's Pocket Levels 20
C. E. Jennings & Co.'s Iron 33⅓
C. E. Jennings & Co.'s Iron, Adjustable, 40&7½%
Stanley R. & L. Co .. 20&10@30&10&10%

Stanley's Duplex.....20@20&10&10%
Woods' Extension.....33⅓&

Poachers, Egg—
Buffalo Steam Egg Poachers, ₱ doz., No. 1, $4.00; No. 2, $5.00 No. 3, $6.00; No. 4, $12.00.....50%

Points, Glaziers'—
Bulk and 1 lb. papers.....lb. 8 c
¼-lb. papers.....lb. 8¾c
¼-lb. papers.....lb. 9¼c

Pokes, Animal—
Ft. Madison Hawkeye.....₱ doz. $3.25
Ft. Madison Western.....₱ doz. $4.00

Police Goods—
Manufacturers' Lists.....25@25&5%
Tower's.....25%

Polish—Metal—
Prestoline Liquid, No. 1 (½ pt.), ₱ doz. $3.00; No. 2 (1 qt.), $9.72.....40%
Prestoline Paste.....40&10%
George William Hoffman:
U. S. Metal Polish Paste, 3 oz. boxes, ₱ doz. 50¢; ₱ gr. $4.50; ½ lb boxes, ₱ doz. $1.25; 1 lb boxes, ₱ doz. $2.25.
U. S. Liquid, 8 oz. cans, ₱ doz. $1.25; ₱ gr. $12.00.
Barkeepers' Friend Metal Polish, ₱ doz. $1.75; ₱ gr. $18.00.
Wynn's White Silk, ¼ pt. cans, ₱ doz.....$2.00

Stove—
Black Eagle Benzine Paste, 5 lb cans, ₱ lb 10¢
Black Eagle, Liquid, ½ pt. cans ₱ doz. 75¢
Black Jack Paste, ¾ lb cans. ₱ gro. $9.00
Black Kid Paste, 5 lb can.....each, $0.65
Ladd's Black Beauty, gr. $10.00.....50%
Joseph Dixon's, ₱ gr. $5.75.....10%
Dixon's Plumbago.....₱ lb 8¢
Fireside.....₱ gr. $2.50
Gem, ₱ gr. $4.50.....10%
Japanese.....₱ gr. $3.50
Jet Black.....₱ gr. $3.50
Peerless Iron Enamel, 10 oz. cans.....₱ doz. $1.50
Wynn's.
Black Silk, 5 lb pail.....each 70¢
Black Silk, ½ lb box.....₱ doz. $1.00
Black Silk, 5 oz. box.....₱ doz. $0.75
Black Silk, ½ pt. liq.....₱ doz. $1.00

Poppers, Corn—
1 qt., Square.....gro. $9.00
1 qt., Round.....gro. $10.00
1½ qt., Square.....gro. 11.00
2 qt., Square.....gro. 13.00

Post Hole and Tree Augers and Diggers—
See also *Diggers, Post Hole, &c.*

Posts, Steel—
Steel Fence Posts, each, 5 ft., 42¢; 6 ft., 46¢; 6½ ft., 48¢.
Steel Hitching Posts, each.....$1.30

Potato Parers—
See *Parers, Potato.*

Pots— Glue—
Enameled.....40%
Tinned.....55%

Powder—
In Canisters:
Duck, 1 lb. each.....55c
Fine Sporting, 1 lb. each.....75c
Rifle, ½-lb. each.....15c
Rifle, 1-lb. each.....25c
King's Semi-Smokeless:
Keg (25 lb bulk).....$6.50
Half Keg (12½ lb bulk).....$3.50
Quarter Keg (6¼ lb bulk).....$1.90
Case 24 (1 lb cans bulk).....$8.50
Half case (1 lb cans bulk).....$4.50

King's Smokeless:	Shot Gun	Rifle
Keg (25 lb bulk)	$12 00	$15.00
Half Keg (12½ lb bulk)	6.25	7.75
Quarter Keg (6¼ lb bulk)	3.25	4.00
Case 24 (1 lb cans bulk)	14.00	17 00
Half case 12 (1 lb cans blk)	7.25	8 75

Robin Hood Smokeless Shot Gun.....50&20%

Presses—Fruit and Jelly—
Enterprise Mfg. Co.....20@25%

Seal Presses—
Morrill's No. 1, per doz. $20.00.....50%

Pruning Hooks and Shears—See *Shears.*

Pullers, Cork—
Invincible Cork Puller.....$21.00

Pullers, Nail—
Cyclops.....50%
Miller's Falls, No. 3, per doz. $12.00.....33⅓&10%
Morrill's No. 1 Nail Puller, ₱ doz. $2.....50%
Pearson No. 1, Cyclone Spike Puller, each $30 00.....50%
Pettican, ₱ doz. $9.00.....40&10%
Scranton, Case Lots:
No. 2 B (large).....$5.50
No. 3 B (small).....$5.00
Smith & Hemenway Co.:
Diamond B, No. 2, ca-e lots. ₱ doz $6.00
Diamond B, No. 3, case lots. ₱ doz $5.50
Gian: No. 1, ₱ doz. $18; No. 2, $16.50; No. 3, $15.....40%

Pulleys—Single Wheel—

Inch	2	2½	3
Awning...doz	$0.55	.85	1.15
Hay Fork, Swivel or Solid Eye..... doz., 4 in., $1.15; 5 in., $1.40			
Inch	2	2¼	2½
Hot House.doz	$0.70	.90	1.25
Inch	1¼	1½	1¾ 2
Screw.....doz	$0.16	.19	.23 .30
Inch	2¼	2	2¼ 2½
Side.....doz	$0 30	.40	.55 .63
Inch.....	1½	1¾	2 2½
Tackle....doz	$0.50	.52	.58 1.00

Stowell's:
Ceiling or End, Anti-Friction...60&10%
Dumb Waiter, Anti-Friction...60&10%
Electric Light.....60%
Side Anti-Friction.....60&10%

Sash Pulleys—
Common Frame; Square or Round End, per doz., 1¼ and 2 in...16@19c
Auger Mortise, no Face Plate, per doz. 1¼ and 2 in......16@19c
Auger Mortise, with Face Plate, per doz., 1¼ and 2 in......16@19c
Acme.....14 in., 16¢; 2 in., 19¢
Fox-All-Steel, Nos. 3 and 7, 2 in. ₱ doz 50%
Grand Rapids All Steel Noiseless....50%
Ideal.....70&10%
Niagara.....1¼ in., 16¢; 2 in., 19¢
No. 26, Troy....1¼ in., 14½¢; 2 in., 16½¢
Star.....1¼ in., 16¢; 2 in., 19¢
Tackle Blocks—See *Blocks.*

Pumps—
Cistern.....60@&10@10%
Pitcher Spout.....80@80&10%
Wood Pumps, Tubing, Etc...45@50%
Barnes Dbl. Acting (low list)....50&10%
Barnes' Pitcher Spout.....80%
Contractors' Rubber Diaphragm No. 2 B. & L. Block Co.....$16.00
Daisy Spray Pump.....₱ doz. $7.20
Flint & Walling's, Fast Mail Hand, (Low List).....55%
Flint & Walling's Fast Mail (low list)...55&5
Flint & Walling's Tight Top Pitcher..80%
National Specialty Mfg. Co., Measuring.....80%
Mechanical Sprayer.....$7.20
Myer's Pumps, low list.....50%
Myers' Power Pumps.....50%
Myers' Spray Pumps.....50%

Pump Leathers—
Plunger and Lower Valve—Per gro.:

Inch..	2	2¼	2¾
	$2.20	2.50	2.75 3.00
Inch..	3	3¼	3½ 3¾ 4
	$3.30	3.60	3.85 4.10 4.40

Plunger Cup Leathers—Per 100:

Inch	2½	3	3½	4
	$2.75	3 85	5.00	6.00

Punches—
Saddlers' or Drive, good..doz. 50@75c
Spring, single tube, good quality... $1.75@2.00
Revolving (4 tubes)..doz. $3.50@3.75
Bemis & Call Co.'s Cast Steel Drive....50%
Bemis & Call Co.'s Check.....55%
Morrill's No. 1 (A.B.C.), ₱ doz., $15.00..50%
No. 2, ₱ doz. $22.50.....50%
Hercules, each $7.50.....50%
Niagara Hollow Punches.....40%
Niagara Solid Punches.....55&10%
Steel Screw, B & K. Mfg. Co.....50%
Tinners' Hollow, P., S. & W. Co.35@35&5%
Tinners' Solid, P., S. & W. Co., ₱ doz., $1.44.....60%

Rail— Barn Door, &c.—
Cast Iron, Barn Door: Flange Screw Holes for Rd. Groove Wheels:

	½	⅝	¾ in.
	$1.70	$2.10	$3 00 100 feet.

Angular for Sq. Groove Wheels:

	Small.	*Med.*	*Large.*
	$1.50	1 90	2.60 100 feet.

Sliding Door, Iron Painted..2¼@2¾c
Sliding Door, Wrought Brass, 1¼ in.....lb.36c..30%
Allith Mfg. Co.:
No. 1, Reliable Hanger Track, ₱ ft..5½¢
No. 2, Reliable Hanger Track, ₱ ft...7¢
Cronk's:
Double Braced Steel Rail, ₱ foot....8¢
O. N. T. Rail.....29¢
Griffin's.:
xxx per 100 ft., 1 x 3-16 in., $3.00; 1¼ x 3-16 in., $3.50.
Hinged Hanger, per 100 ft. 1 x 3-16 in., $3.10; 1¼ x 3-16 in., $3.60.
Lane's:
Hinged Track, ₱ 100 ft., 1 in., $3.70; 1¼ in. $4.40
O. N. T., ₱ 100 ft., 1 inch, $2.75; 1¼ inch, $3.50; 1½ inch $4.00.
Standard, 1¼ in., ₱ 100 ft.....4.00
Lawrence Bros.:
₱ 100 ft. No. 201, $4.00; No. 202, $4.40
New York, 1 x 3-16 in., ₱ 100 ft. $2.75
McKinney's.:
Hinged Hanger Rail ₱ foot, 11¢.....50%
None Better.....₱ ft. 3¾¢
Standard.....₱ ft. 4 c
Myers' Stayon Track.....60%
Richards Mfg. Co.:
Common 1 x 3-16 $2.75; 1¼ x 3-16, $3.25; 1¼ x 3 16, $3.50
Special Hinged Hanger Rail.....$1.40
Fire Door Track, ₱ ft. 2 x ⅜, 15¢; 3½ x ⅜, 9¢.
Lag Screw Rail, No. 65.....40%
Gauge Trolley Track, ₱ ft. No. 31, 10¢; No. 32, 15¢; No. 33, 24¢
Safety Door Hanger Co.'s Storm King Safety.....60%
Safety Door Hanger Co.'s U.S. Standard.....60%
Stowell's.:
Cast Rail.....₱ ft. 13½¢
Steel Rail, Plain.....25%
Wrought Bracket, 1 3-16 in.....₱ ft. 8¢
Wrought Bracket, 1¼x3-16.....₱ ft. 7¢
Swett's Hyio, per ft. 11¢.....60%
P. L. B. Steel Rail, ₱ 100 ft.....$3.00
No. 0, 1x3-16, ₱ 100 ft.....$2.75

Rakes—
Net Prices, Malleable Rakes:

	10	12	14	16-tooth
Shank.....	$1.50	1.60	1.75	1.85
Socket.....	$1.65	1.80	1.95	2.10

Steel. Garden and Gravel, Aug. 1, '99 List.....70%
Malleable Iron, Garden.....70&10%
Lawn Rake, Metal Head, per doz., 20 teeth.....$3.25@3.50
24 teeth.....$3.50@3.75
Weldless Steel Garden.....75&5%
Fort Madison Red Head Lawn.....$3 25
Fort Madison Blue Head Lawn.....$2.70
Jackson Lawn, 29 and 30 teeth, ₱ doz., net. $4.25
Kohler's:
Lawn Queen, 20-tooth, ₱ doz.....$3 45
Lawn Queen, 24-tooth, ₱ doz.....$3.60
Paragon, 20 tooth, ₱ doz.....$2.75
Paragon, 24-tooth, ₱ doz.....$3.00
Steel Garden, 14-tooth, ₱ doz.....$2.88
Malleable Garden, 14-tooth, ₱ doz., $1.75@2.00

Rasps, Horse—
Disston's.....75%
Heller Bros.....70&5&20&10&5%
McCaffrey's American Standards&10&5%
New Nicholson.....70&10@75%
See also *Files.*

Razors—
Borasic.....60%
Fox Razors, No. 42, ₱ doz. $20.00
Fox Razors, No. 44, ₱ doz. $20.00 } 40% dis.
Fox Razors, No. 82, Platina, ₱ doz. $25 00
Red Devil.....60%
Silberstein:
Carbo Magnetic.....$18.00
Griffon, No. 65.....$15.00
Griffon, No. 00.....$12.00
All other Razors.....40%

Safety Razors—
Silberstein.....40%

Reels— Fishing—
Hendryx:
M 6, Q 6, A 6, B 6, M 9¼, M 14, Q 16, A 16, B 16, 4008, Rubber Populo, Nickeled Populo.....20%
Aluminum, German Silver, Bronze.25%
1240 N, 124 N.....20%
3004 N, 06 N, 6 RM, G 9.....25%
4 N, 5 PN, 24 N, 26 PN.....20%
2904 P.....33⅓&5%
2904 PN.....33⅓&5%
0924 N.....33⅓&5%
02084 N.....33⅓&5%
002904 PN.....33⅓&5%
802 N.....33⅓&5%
986 PN, 2904 N, 974 PN.....25%
5009 PN, 5009 N.....20%
Competitor, 102 P, 102 PN, 202 P, 202 PN, 102 PR, 202 PR.....25%
504 P, 304 PN, 00304 P, 00304 PN.33⅓&5%

Registers—*List July 1, 1903.*
Black Jap
White Jap
Bronzed
Nickel Plated
Electro Plated } 75&10@80

Revolvers—
Single Action.....85@90c
Double Act n, except 44 cal......$1.90
Double Action, 44 caliber.....$2 05
Automatic.....$3.60
Hammerless.....$4.10
Note.—Jobbers frequently cut the above prices of manufacturers for small trade.

Riddles, Hardware Grade
16 in., per doz......$2.25@$2.50
17 in., per doz......$2.50@$2.75
18 in., per doz......$2.75@$3 00

Rings and Ringers—
Bull Rings—

	2	2½	3 *Inch*
Steel.....	$0 70	0.75	0.80 *doz.*
Copper.....	1.00	1.15	1.40 *doz.*

Rea's Improved Self-Piercing, Copper, 2 in., ₱ doz., $1.25; 2½ in., $1.50 3 in., $1.75.

Hog Rings and Ringers—
Hill's Rings...gro. boxes, $4.00@4.25
Hill's Ringers, Gray Iron. doz. 50@55c
Hill's Ringers, Mal. Iron, doz. 70@75c
Blair's Rings.....per gro. $4.75@5.00
Blair's Ringers...per doz. $0.60@ .65
Brown's Rings....per gro. $5.00@5.25
Brown's Ringers..per doz. $0.65@ .70

Rivets and Burrs—
Copper.....60¢&@90¢&10%
Iron or Steel.....75¢&5@75¢&10%

Rollers—
Acme, Stowell's Anti-Friction.....50%
Barn Door, Sargent's list.....60%
Cronk's Stay.....7½¢
Cronk's Brinkerhoff.....90¢
Lane's Stay.....40%
Richards' Stay:
Handy Adj. and Reversible No. 59....40%
O. K. Adj. and Reversible, No. 58....50%
Lag Screw, Nos. 55 and 57.....50%
Fire Door, No. 59.....40%
Favorite, No. 54.....40%
Stowell's Barn Door Stay.....₱ doz. $1 00
Swett's Anti Friction.....50%
Screw and Spike Stay.....₱ doz 65¢
Hinge Adjustable Stay.....₱ doz. 90¢

Rope—
Manila, 7-16 in. diam. and larger:
Mixed.....lb. 10 @11 c
Pure.....lb. .. @11½c
Manila, Hay, Hide and Bale Ropes, Medium and Coarse.....lb. 10 @11½c
Sisal, 7-16 in. diam. and larger:
Mixed.....lb. 7½c
Pure.....lb. 9 c
Sisal, Hay, Hide and Bale Ropes, Medium and Coarse:
Mixed.....lb. 7½c
Pure.....lb. 9 c
Sisal, Tarred, Medium Lath Yarn:
Mixed.....lb. 7 c
Pure.....lb. 8½c
Cotton Rope:—Lb.—
Best.....¼-in. and larger.....15½c
Medium.....¼ in. and larger.....15½c
Common.....¼-in. and larger.....10½c
Jute Rope:
Thread No. 1, ¼-in. and up, lb. 6 c
Thread No. 2, ¼-in. and up, lb. 5½c
Wool Twine.....lb. 5½c
Old Colony Manila Transmission Rope, ₱ lb 17½¢

Wire Rope—
Galvanized.....47½&5%
Plain.....55&5%

Ropes, Hammocks—
Covert Mfg. Co.:
Jute.....50&5%
Sisal.....5 &5%
Covert Saddlery Works.....60&5%

Rules—
Boxwood.....60&10&10%
Ivory.....35&10@35&10&5%
Chapin-Stephens Co.:
Boxwood.....60@60&10%
Ivory.....35 a35&10a10%
Miscellaneous.....50@50&10&10%
Combination.....35@35&10%
Stationers'.....10@10&10%
Lufkin's Steel.....50&10%
Lufkin's Lumber.....70%
Stanley R. & L. Co.:
Boxwood.....60@60&10%
Ivory.....35@35&10&10%
Upson Nut Co.:
Boxwood.....60@60&10%
Ivory.....35&10@35&10&10%

Sash Balances—See *Balance Sash.*

Sash Locks—See *Locks, Sash*

Sash Weights—
See *Weights, Sash.*

Sausage Stuffers or Fillers—See *Stuffers or Fillers, Sausage.*

Saw Frames—See *Frames, Saw.*

Saw Sets—See *Sets, Saw.*

Saw Tools—See *Tools, Saw.*

Saws—
Atkins:
Circular.....50%
Band.....50&10@60%
Cross Cuts.....35&5%
Mulay, Mill and Drag.....50%
One-Man Saw.....40%
Wood Saws.....40%
Hand, Compass, &c.....40%
Chapin-Stephens Co.:
Turning Saws and Frames....30@30&10%
Diamond Saw & Stamping Works:
Sterling Kitchen Saws.....30&10&5%
Disston's:
Circular, Solid and Inserted Tooth..50%
Band, 2 to 14 in wide.....60%
Band, ¼ to 1¾.....60%
Crosscuts.....50%
Narrow Crosscuts.....55%
Mulay, Mill and Drag.....50%
Framed Woodsaws.....35%
Woodsaw Blades.....35%
Woodsaw Rods.....25%
Hand Saws, Nos. 12, 99, 9, 16, d100, D8, 120, 79, 77, 8.....25%
Hand Saws, Nos 7. 107, 107½, 8, 1, 0, 00, Combination.....30%
Compass, Keyhole, &c.....25%
Butcher Saws and Blades.....35%
C. E. Jennings & Co.'s.:
Back Saws.....25%
Butcher Saws.....30%
Compass and Key Hole Saws.....35&5%
Framed Wood Saws.....30%
Hand Saws.....20&2½%
Wood Saw Blades.....35%
Millers Falls:
Butcher Saws.....15&10%
Star Saw Blades.....15&10%
Peace & Richardson's Hand Saws.....30%
Simonds':
Circular Saws.....50%
Crescent Ground Cross Cut Saws..35%
One-Man Cross Cuts.....40&10%
Gang Mill, Mulay and Drag Saws..50%
Band Saws.....50%
Back Saws.....25@25&7½%
Butcher Saws.....35@35&7½%
Hand Saws.....25@25&7½%
Hand Saws, Bay State Brand.....25%
Compass, Keyhole, &c.....25@25&7½%
Wood Saws.....35@35&7½%
Springfield Mach. Screw Co.:
Diamond Kitchen Saws.....40&10@50%
Butcher Saws Blades.....35&40%
Wheeler, Madden & Clemson Mfg. Co.'s
Cross Cut Saws.....50%

Hack Saws—
Atkins' Hack Saw Blades A A A. ... 25%
Disston:
Concave Blades.....25%
Keystone.....40%
Hack Saw Frames.....30%
Fitchburg File Works, Tue Best.....25%
C. E. Jennings & Co.'s:
Hack Saw Frames, Nos. 175, 180.....40&7½%
Hack Saws, Nos. 175, 180, complete.....40&7½%
Goodell's Hack Saw Blades.....40%
Griffin's Hack Saw Frames..35&5&10%
Griffin's Hack Saw Blades.....35&5&10%
Springfield Mach. Screw Co.:
Diamond Hack Saw Blades.....35%
Diamond Hack Saw Frames.....50%
Star Hack Saws and Blades.....15&10%
Sterling Hack Saw Blades.....35%
Sterling Hack Saw Frames.....30& 0&5%

Scroll—
Barnes' No. 7, $15.....25%
Barnes' Scroll Saw Blades.....40%
Barnes' Velocipede Power Scroll Saw, without boring attachment, $18; with boring attachment, $20.....20%
Lester, complete, $10.00.....15&10%
Rogers, complete, $4.00.....15&10%

Scalers, Fish—
Covert's Saddlery Works.....60&10%

Scales—
Family, Turnbull's.....50@50&10%
Counter:
Hatch, Platform, ½ oz to 10 lbs. doz $5.50
Two Platforms, ½ oz to 8 lbs, doz, $10
Union Platform, Plain..$1.70@1.90
Union Platform, Striped $1.85@2.15
Chatillon's:
Eureka.....25%
Favorite.....40%
Grocers' Trip Scales.....50%
Chicago Scale Co.:
The "Little Detective," 25 lbs.....50%
Union or Family No. 2.....60%
Portable Platform (reduced list).....50%
Wagon or Stock (reduced list)...25@35%
"The Standard" Portables.....50%
"The Standard" R. R. and Wagon.....50%

Scrapers—
Box, 1 Handle.....doz. $2.00@2.25
Box, 2 Handle.....doz. $2.60@2.85
Ship Light, $2.00; Heavy, $4.50
Adjustable Box Scraper (S. R. & L. Co.) $6.00.....30@30&10%
Chapin-Stephens Co., Box.....50@50&10%

Screens, Window, and Frames—
Flyer Pattern Screens...60&5@60&5&2½%
Maine Screen Frames.....40&10&5%
Perfection Screens.....60&5@60&5&2½%
Phillips' Screen Frames, 60&5@60&5&2½%
See also *Doors.*

Screws—Bench and Hand—

Bench, Iron..doz. 1 in.. $2.50@2.75 :
1½, $3.00@3.25: 1¼, $3.50@3.75
Bench, Wood, Beech....doz. 30@30&5
Hand, Wood.....30@30&5%
R. Bliss Mfg. Co., Hand.....30@30&10%
Chapin-Stephens Co., Hand.....30@30&10%
Ohio Tool Co., Bench and Hand.....30%

Coach, Lag and Hand Rail—

Lag, Common Point, list Oct. 1. '99.....80@80&10%
Coach and Lag, Gimlet Point, list Oct. 1. '99.....75&10&5@80&5%
Hand Rail, list Jan. 1, '81..70&10@75%

Jack Screws—

Standard List.....75&10@80&5%
Millers Falls.....50&10&10%
Millers Falls, Roller.....50&10%
P., S. & W.....50@50&5%
Sargent.....70&10%
Swett Iron Works.....75&10@80&5%

Machine—

List Jan. 1, '98.
Flat or Round Head, Iron..50@55&10%
Flat or Round Head, Brass..50@50&10%

Set and Cap—

Set (Iron or Steel).....75% } *Extra*
Sq. Hd. Cap.....70% } *10&5*
Hex. Hd. Cap.....70% } *often*
Rd. or Fillister Hd. Cap 65% } *given.*

Wood—

List July 23, 1903.
Manufacturers' printed discounts :
Flat Head, Iron.....87½&10@....%
Round Head, Iron.....85&10@....%
Flat Head, Brass.....85&10@....%
Round Head, Brass.....80&10@....%
Flat Head, Bronze....77½&10@....%
Round Head, Bronze.....75&10@....%
Drive Screws.....87½&10%

Scroll Saws—See *Saws, Scroll.*

Scythes—

Per doz.
Prices announced for next season :
Clipper Pattern, Grass.....$6.30
Full Polished, Clipper.....$6.75
Grain.....$8.00
Clipper, Grain.....$8.25
Weed and Bush.....$6.25

Seeders—Raisin—

Enterprise.....25@30%

Sets—Awl and Tool—

Brad Awl and Tool Sets :
Wood Hdle., 10 Awls doz. $2.00@2.25
Wood Hdle., 1½ Awls, 6 Tools doz. $2.50@2.60
Aiken's Sets, Awl and Tools :
No. 20, ₱ doz. $10.00.....50&10&10%
Fray's Adj. Tool H'dls...Nos. 1, $12; 2, $18; 3, $12; 4, $9; 5, $7.....50%
C. E. Jennings & Co.'s Model Tool Holders.....30%
Millers Falls Adj. Tool H'dls, No. 1, $12; No. 4, $12; No. 5, $18.....15&10%
Stanley's Excelsior :
No. 1, $7.50; No. 2 $4.00; No. 3, $5.50.....30@30&10&10%

Garden Tool Sets—

Ft. Madison, Three Pieces, Hoe, Rake and Shovel.....₱ doz. sets.....$9.00

Nail—

Square.....per gro. $2.25@2.50
Round, Blk. and Pol., assorted..... gro. $1.80@2.00
Octagon.....gro. $4.50@5.75
Buck Brothers.....37½%
Cannon's Diamond Point, ₱ gr. $13..25%
Mayhew's.....per gro. $9.00
Snell's Cannon's Diamond Pt ₱ gro. $7.20
Snell's Corrugated, Cup Pt. per gro. $7.20
Snell's Knurled, Cup Pt.....per gro $7.20
Springfield Mach. Screw Co.:
Diamond Knurled, Cup Pt., per gro. $7.50

Rivet—

Regular list.....75@75&10%

Saw—

Aiken's:
Genuine.....50&10%
Imitation.....50&10%
Atkin's:
Criterion.....40%
Adjustable.....40%
Bemis & Call Co's.:
Cross Cut.....30%
Plate.....20%
Disston's Star and Monarch.....35%
Morrill's No. 1, $15.00.....50%
Nos. 3 and 4, Cross Cut, $20.83.....50%
No. 5, Mill, $30.00.....50%
Nos. 10, 11, 9½, $15.63.....50%
No. 1 Old Style, $10.00.....50%
Special, $16.25.....50%
Giant Royal Cross Cut.....₱ doz. $8.50
Royal Hand.....₱ doz. $5.01
Taintor Positive.....₱ doz $6.75

Shaving—

Fox Shaving Sets, No. 30, per doz, $24.00net

Sharpeners, Knife—

Chicago Wheel & Mfg. Co.....65%

Shaves, Spoke—

Iron.....doz. $1.00@1.15
Wood.....doz. $1.75@2.00
Bailey's (Stanley R. & L. Co.).....0@30&10&10%
Chapin-Stephens Co.....40@30&10&10%
Goodell's, ₱ doz. $9.00.....15&10%
Wood's F1 and F2.....50%

Shears—

Cast Iron...	*7*	*8*	*9 in.*
Best	*$16.00*	*18.00*	*20.00 gro.*
Good	*$13.00*	*15.00*	*17.00 gro.*
Cheap	*$5.00*	*6.00*	*7.00 gro.*

Straight Trimmers, &c.:
Best quality, Jap.....70@70&10%
" Nickel.....60@60&10%
Fair qual. Jap.....80@80&5%
" Nickel.....75@75&10%
Tailors' Shears.....40@40&10%
Acme Cast Shears.....40@40&5%
Heinisch's Tailors' Shears.....10%
Wilkinson's Hedge.....1900 list 45%
Wilkinson's Branch, Lawn and Border40%
Wilkinson's Sheep.....1900 list. 50%

Tinners' Snips—

Steel Blades.....30&5@30&10
Steel Laid Blades.....40&10@50%
Forged Handles, Steel Blades, Berlin.....40@40&10%
Heinisch's Snips.....40%
Jennings & Griffin Mfg. Co.'s, 6½ to 10 inch.....50%
Niagara Snips.....40%
P., S & W. Co.....20%

Pruning Shears and Tools—

Cronk's Grape Shears.....33⅓%
Cronk's Pruning Shears.....33⅓%
Disston's Combined Pruning Hook and Saw, ₱ doz. $18.00.....25%
Disston's Pruning Hook, ₱ doz. $12.00.....25%
John T. Henry Mfg. Co.:
Pruning Shears, all grades...40@40&5%
Orange Shears.....50&10@50&20%
Grape.....40&10@50%
Tree Pruners.....75%
P., S. & W. Co.....33⅓%

Sheaves—Sliding Door—

Stowell's Anti-Friction.....50%
Patent Roller Hatfield's, Sargent's list.....70&10%
Reading.....60%
R. & E. list.....33⅓%
Wrightsville Hatfield Pattern.....50%

Sliding Shutter—

Reading list.....45&20%
R. & E. list.....34⅓%
Sargent's list.....50&10%

Shells—Shells, Empty—

Brass Shells, Empty :
First quality, all gauges.....60&5%
Climax, Club, Rival, 10 and 12 gauge..65&5%
Paper Shells, Empty :
Acme, Ideal, Leader, New Rapid, Magic 10, 12, 16 and 20 gauge..25&5%
Blue Rival, New Climax, Challenge, Monarch, Defiance, Repeater, Yellow Rival, 10, 12, 13 and 20 gauge.....20%
Climax, Union, League, New Rival 10 and 12 gauge.....25%
Climax, Union, League, New Rival, 14, 16 and 20 gauge ($7.50 list)..20%
Expert, Metal Lined and Pigeon, 10, 12, 16 and 20 gauge.....33⅓&5%
Robin Hood, Low Brass.....20&10%
Robin Hood, High Brass.....30&10%

Shells, Loaded—

Loaded with Black Powder.....40%
Loaded with Smokeless Powder, medium grade.....40&5%
Loaded with Smokeless Powder, high grade.....40&10&10%
Robin Hood Smokeless Powder:
Robin Hood, Low Brass.....50%
Comets, High Brass.....50&10&5%

Shoes, Horse, Mule, &c.—

F. o. b., Pittsburg:
Iron.....per keg $4.00
Steel.....per keg 3.75
Burden's, all sizes ₱ keg.....$3.90

Shot—

Drop, up to B, 25-lb. bag.....$1.65
Drop, B and larger, per 25-lb. bag $1.90
Buck, 25-lb. bag.....$1.90
Chilled, 25-lb. bag.....$1.90

Shovels and Spades—

Association List, Nov. 15, 1902....40%

Sieves and Sifters—

Hunter's Imitation, gro. $10.50@11.00
Buffalo Metallic Tinned, S. S. Co., ₱ gr.:

14&16	16&18	18&20
$13.20	$13.50	$14.40

Hunter's Genuine.....₱ gro. $12.00@12.50
Shaker Barber's Pat.) Flour Sifters.. ₱ doz., $2.00.....30%

Sieves, Seamless Metallic—

Per dozen

Mesh	*14*	*16*	*18*	*20*
Iron Wire	*$1.05*	*1.05*	*1.10*	*1 20*
Tinned Wire	*$1.15*	*1.15*	*1.20*	*1.30*

Sieves, Wooden Rim—

Nested, 10, 11 and 12 Inch.
Mesh 18, Nested, doz.....$0.90@0.95
Mesh 20, Nested, doz.....1.00@1.05
Mesh 24, Nested, doz.....1.30@1.40

Sinks—

Cast Iron—

Standard list.....60@60&10%
NOTE.—*There is not entire uniformity in lists used by jobbers.*

Skeins Wagon—

Cast Iron.....8.5&15@8.5&10&10%
Steel.....40@40&10%

Slates, School—

Factory Shipments.
"D" Slates.....50@50&10%
Eureka, Unexcelled Noiseless..60¢ 5 tens
Victor A, Noiseless.....60¢ 5 tens&5%

Slaw Cutters—See *Cutters.*

Snaps, Harness—

German.....40@40&10%
Covert Mfg. Co.:
Derby.....20&5&2½
High Grade.....45%
Jockey.....30&10%
Trojan.....45%
Yankee.....30&5&2½
Yankee, Roller.....30&5&2½
Covert's Saddlery Works:
Crown.....60%
German.....60%
Model.....60
Triumph.....60%
Oneida Community Solid Swivel.....60%
Sargent's Patent Guarded.....66⅔&10%

Snaths—

Scythe.....45&10%

Snips, Tinners'—See *Shears.*

Spoons and Forks—Silver Plated—

Good Quality.....50&10@60&5%
Cheap.....60@60&10%
International Silver Co.
1847 Rogers Bros. and Rogers & Hamilton.....40&10%
Rogers & Bro., William Rogers Eagle Brand.....50&10%
Anchor, Rogers Brand.....60%
Wm. Rogers & Son.....60&10%

Miscellaneous—

German Silver.....60@60&5%
Cattaraugus Cutlery Co.:
Seneca Silver.....50%

Tinned Iron—

Teas.....per gro. 45@55c
Tables.....per gro. 90c@$1.00

Springs—Door—

Chicago (Coil).....40&10%
Gem (Coil).....20%
Pullman (Coil).....0%
Reliance (Coil).....40&10%
Star (Coil).....30%
Torrey's Rod, 39 in.....₱ doz. $1.10
Victor (Coil).....50&10&10%

Carriage, Wagon, &c.

1¼ in. and Wider:	*Per. Lb.*
Black	*4¼c*
Half Bright	*4¼c*
Bright	*4¾c*

Painted Seat Springs :
1½ x 2x 26, per pr.....42c
1½ x 3 x 28 per pr.....70c

Sprinklers, Lawn—

Enterprise.....25@30%
Philadelphia No. 1, ₱ doz. $12; No. 2, $15; No. 3, $24.....30%

Squares—

Nickel plated.... } List Jan. 5, 1900.
Steel and Iron... } 70&10@75&10%
Rosewood tidl Try Square and T-Bevels.....60&10&10@70%
Iron Hdl. Try Squares and T-Bevels, 40&10@40&10&10%
Disston's Try Sq. and T-Bevels.....30%
Winterbottom's Try and Miter.....40&10@40&10&10%

Squeezers—Lemon—

Wood, Common, gro., No. 0, $5.25 @$5.50 : No. 1, $6.25@$6.50.
Wood, Porcelain Lined.
Cheap.....doz. $1.00
Good Grade.....doz. $1.25
Tinned Iron.....doz. $0.75@1.25
Iron, Porcelain Lined.....doz. $1.75

Staples—

Barbed Blind.....lb. 6@6½c
Electricians', Association list..... 80&10&10%
Fence Staples, Plain $2.25; Galvanized.....$2.55
Poultry Netting, Staples....per lb.. 2¼@2½c
Grand Crossing Tack Co.'s list.....80&10%

Steels, Butchers'—

Dick's.....30%
Foster Bros'.....30%
C. & A. Hoffmann's.....40%

Steelyards.....30@30&10%

Stocks and Dies—

Blacksmiths'.....50@50&10%
Curtis Reversible Ratchet Die Stock.25%
Derby Screw Plates.....25%
Gardner Die Stocks No. 1.....50%
Gardner Die Stocks, larger sizes.....40%
Green River.....25%
Lightning Screw Plate.....25%
Little Giant.....25%
Reece's New Screw Plates.....25%

Stone—

Scythe Stones—

Chicago Wheel & Mfg. Co:
Gem Corundum, 10 inch, $8.00 per gro., 12 inch, $10.80
Norton Emery Scythe Stones:
Less than gross lots.....₱ gro. $9.00
One gross or more.....₱ gro. $7.20
Lots of 10 gross or more....₱ gro $6.00
Pike Mfg. Co. 1901 list:
Black Diamond S. S....₱ gro. $12.00
Lamoille S. S.....₱ gro. $11.00
White Mountain S. S....₱ gro. $9.00
Green Mountain S. S....₱ gro. $6.00
Extra Indian Pond S. S.₱ gro. $7.50
No. 1 Indian Pond S. S..₱ gro. $7.00
No. 2 Indian Pond S. S..₱ gro. $4.50
Leader Red End S. S....₱ gro $4.50
Emery and Corundum, 10 inch..₱ gro.....$9.00
Pure Corundum, 10 inch. ₱ gro $12
Crescent.....$7.00
Emery Scythe Rifles, Two Coat $8
Emery Scythe Rifles, Three Coat, $10
Emery Scythe Rifles Four Coat, $12
Balance of 1904 list 33⅓% } 33⅓%

Oil Stones, &c.

Chicago Wheel & Mfg. Co., 1901 list:
Gem Corundum Oil, Double Grit....50%
Gem Corundum Axe, Single or Double Grit.....55%
Gem Corundum Slips.....55%
Gem Corundum Razor Hones.....50%
Pike Mfg. Co. 1901 list: ₱ lb.
Arkansas Stone, No. 1, 3 to 5½ in. $2.80
Arkansas Stone, No. 1, 5½ to 8 in. $3.50
Arkansas Slips No. 1.....$4.00
Lily White Washita 4 to 8 in.....60¢
Rosy Red Washita, 4 to 8 in.....60¢
Washita Stone, Extra, 4 to 8 in..50¢
Washita Stone, No. 1, 4 to 8 in..40¢
Washita Stone, No. 2, 4 to 8 in..30¢
Lily White Slips.....90¢
Rosy Red Slips.....90¢
Washita Slips, Extra.....80¢
Washita Slips, No. 1.....70¢ } 33⅓%
Washita Slip, No 2.....40¢
India Oil Stones (entire list).....33⅓%
Quickcut Emery and Corundum Oil Stone, Double Grit.....33⅓%
Quickcut Emery and Corundum Axe Stone, Single or Double Grit....33⅓%
Quickcut Emery Rubbing Bricks.33⅓%
Hindostan No. 1, Regular....₱ ℔ 8¢
Hindostan No. 1 Small.....₱ ℔ 10¢
Axe Stones (all kinds).....
Turkey Oil Stones, ex. 5 to 8 in. ₱ ℔ 60¢
Queer Creek Stones, 4 to 8 in.....20¢
Queer Creek Slips.....40¢
Sand Stone.....6¢ } 33⅓%
Belgian, German and Swaty Razor Hones.....50%
Natural Grit Carving Knife Hones, ₱ doz.....$3.00
Quick Edge Pocket Knife Hones, ₱ doz.....$2.50
Mounted Kitchen Sand Stone, ₱ doz.....$1.50 } 40%

Stoners—Cherry—

Enterprise.....25@30%

Stoppers, Bottle—

Victor Bottle Stoppers.....₱ gro. $9.00

Stops, Bench—

Millers Falls.....15&10%
Morrill's...₱ doz., No. 1, $10.00.....70%
Morrill's, No. 2, $12.50.....50%

Door—

Chapin-Stephens Co.....60@60&10%

Plane—

Chapin-Stephens Co.....20%

Straps—Box—

Cary's Universal, case lots....20&10&10%

Hame—

Covert's Saddlery Works.....60&10%

Stretchers, Carpet—

Cast Iron, Steel Points....doz. 55@60¢
Socket.....doz. $1.75
Excelsior Stretcher and Tack Hammer Combined, per doz, $6.....20%

Stuffers, Sausage—

Enterprise Mfg. Co.....25@25&7½%
National Specialty Mfg. Co., list Jan. 1, 1902.....30&5%

Sweepers, Carpet—

National Sweeper Co.: Per doz.
Auditorium, Roller Bearing (26 in case), Nickel.....$54.00
Mammoth, Roller Bearing (60 in case), Nickel.....$60.00
Marion, Roller Bearing, regular finishes, full Nickel.....$24.00
Marion Queen, Roller Bearing, full Nickel.....$24.00
Monarch, Roller Bearing, Nickel..$22.00
Monarch, Roller Bearing, Jap'ned.$20.00
Transparent, Roller Bearing, Plate Glass Top, Nickel.....$36.00
Monarch Extra, Roller Bearing, (17-inch case), Nickel.....$36.00
Monarch Extra, Roller Bearing (17-inch case), Japanned.....$33.00
National Queen, Fancy Veneers...$27.00
Perpetual, Regular Bearings, Nkl.$20.00
Perpetual, Regular Bearings, Jap.$18.00
NOTE.—*Rebates: 50c per dozen on three-dozen lots; $1 per dozen on five-dozen lots; $2 per dozen on ten-dozen lots; $2.50 per dozen on twenty-five-dozen lots.*

Tacks, Brads, &c.—

List Jan. 15, '99.
Carpet Tacks.....80&30@10@....%
American Cut Tacks....90@25@....%
Swedes Cut Tacks.90@30@10@5@....%
Swedes Upholsterers' Tacks..... 90@45@10@5@....%
Gimp Tacks.....90@45@10@....%
Lace Tacks.....90@45@10@....%
Trimmers' Tacks..90@30@10@5@....%
Looking Glass Tacks.10@10@5@....%
Bill Posters' and Railroad Tacks... 90@45@@10....%
Hungarian Nails....80@30@5@....%
Common and Patent Brads..... 80@10@5@....%
Trunk and Clout Nails..80@10@....%
NOTE.—*The above prices are for Straight Weights.* An extra 5% is given Star Weights.** and an extra 10@2½% on Standard Weights.****

Miscellaneous—

Double Pointed Tacks. 90 & 6 or 7 tens
Steel Wire Brads, R. & E. Mfg. Co.'s list..50&10@60%

See also *Nails, Wire.*

Tanks, Oil—

	Each.
Emerald, S. S. & Co.	30-gal $3.40
Emerald, S. S. & Co.	60-gal., $4.25
Queen City S. S. & Co.,	30-gal. $3.65
Queen City S. S. & Co.,	60-gal $4.50

Tapes Measuring—

American Asses' Skin.....40@40&10@50%
Patent Leather.....25@30&5%
Steel.....40@40&10%
Chesterman's.....25@25&5%
Eddy Asses' Skin.....40&10&50%
Eddy Patent Leather.....25&30&5%
Eddy Steel.....40@40&10%
Keuffel & Esser Co., Steel and Metallic, Lower list, 1903.....35%
Lufkin's Steel.....33⅓&35%
Lufkin's Metallic.....30&30&5%

Teeth, Harrow—

Steel Harrow Teeth, plain or headed, ⅝ inch and larger per 100 lbs...$3.00

Thermometers—

Tin Case.....80@10@80@10@5%

Ties, Bale—Steel Wire.

Single Loop.....80@2½%
Monitor, Cross Head, Etc.....70%

Brick Ties—

Niagara Brick Ties.....25&10%

Tinners' Shears, &c.—

See *Shears, Tinners', &c.*

Tinware—

Stamped, Japanned and Pieced, sold very generally at net prices.

Tips, Safety Pole—

Covert's Saddlery Works.....60&10%

Tire Benders, Upsetters, &c.—See *Benders and Upsetters, Tire.*

Tools— Coopers'—
L. & I. J. White ..... 20@20&5%

Hay—
Myers' Hay Tools 50%
Stowell's Hay Carriers 5%
Stowell's Hay Forks 50%
Stowell's Fork Pulleys 5%

Saw—
Atkins' Cross Cut Saw Tools 40%
Simonds' Improved 33⅓%
Simonds' Crescent 25%

Ship—
L. & I. J. White 25%

Transom Lifters—
See *Lifters, Transom.*

Traps— Fly—
Balloon, Globe or Acme ..... doz. $1.15@1.25; gro. $11.50@12.00
Harper, Champion or Paragon ..... doz. $1.25@1.40: gro. $13.00@13.50

Game—
Oneida Pattern ..... 75&10@75&10&5%
Newhouse ..... 45@45&5%
Hawley & Norton ..... 65@65&5%
Victor (Oneida Pattern) ..... 75@75&5%
O.C. Jump (Blake Pattern) 60@5@60&10%

Mouse and Rat—
Mouse, Wood, Choker, doz. holes ..... 8½@9c
Mouse, Round or Square Wire ..... doz. 85@90c
Marty French Rat and Mouse Traps (Genuine):
No. 1, Rat, Each $1.12½; ₱ doz. $12.00
No. 3, Rat, ₱ doz. $6.00; case of 50 $5.25 doz.
No. 3½, Rat, ₱ doz. $4.75; case of 72 $4.25 doz.
No. 4, Mouse, ₱ doz. $3.50; case of 7 $4.75 doz.
No. 5, Mouse, ₱ doz. $2.75; case of 150 $2.25

Trimmers. Spoke—
Wood's E I 50%

Trowels—
Disston Brick and Pointing 30%
Disston Plastering 25%
Disston "Standard Brand" and Garden Trowels 35%
Kohler's Steel Garden Trowels, 5 in. ..... ₱ gro. $1.80
Kohler's Steel Garden Trowels, 6 in ..... ₱ gro. $6.00
Never-Break Steel Garden Trowels ..... gro. $6.00
Rose Brick and Plastering ..... 25&5%
Woodrough & McParlin, Plastering 25%

Trucks, Warehouse, &c.—
B. & L. Block Co.:
New York Pattern ..... 50&10%
Western Pattern ..... 60&10%
Handy Trucks ..... per doz. $16.00
Grocery ..... per doz. $15.00
Daisy Stove Trucks, Improved pattern ₱ doz. $18.50
Model Stove Trucks ..... ₱ doz. $18.50

Tubs, Wash—

No.	*1*	*2*	*3*
Galvanized, per doz.	*$4.75*	*5 25*	*6.00*
Galvanized Wash Tubs (S. S. & Co.):			
No.	1	2	3
Per doz., net	$5.70	6.50	7.20
	6.30	7 20	8.10

Twine—Miscellaneous—

Flax Twine—	*BC*	*B.*
No. 9, ¼ and ½-lb. Balls	*.22c@24c*	
No. 12, ¼ and ½ lb. balls	*.18c@20c*	
No. 18, ¼ and ½-lb. Balls	*.16c@18c*	
No. 24, ¼ and ½-lb. Balls	*.16c@18c*	
No. 36, ¼ and ½-lb. Balls	*.15c@17c*	
Chalk Line, Cotton, ½-lb Balls		*.30c*
Cotton Wrapping 5 Balls to lb doz		*.9@11c*
Cotton Wrapping 5 Balls to lb according to quality		*.13½c@20c*
American 2-Ply Hemp, ¼ and ½-lb. Balls		*.15@14c*
American 3 Ply Hemp, 1-lb. Balls		*.13@14c*
India 2-Ply Hemp, ¼ and ½-lb. Balls (Spring Twine)		*.8c*
India 3-Ply Hemp, 1-lb. Balls		*.7@8c*
India 3-Ply Hemp, 1¼-lb. Balls		*.6@7c*
2, 3, 4 and 5-Ply Jute, ½-lb. Balls		*.9@10c*
Mason Line, Linen, ½-lb. Balls		*.46c*
No. 2½ Mattress, ¼ and ½-lb Balls		*.37c*
Wool, 3 to 6 ply		*.5½@6c*

Vises—
Solid Box ..... 50&10@60%

Parallel—
Athol Machine Co:
Simpson's Adjustable 40%
Standard 40%
Amateur 25%
Columbian Hdw. Co 40%
Emmert Universal:
Pattern Makers' No. 1, $15.00; No. 2, $12.50; No. 3, $10.00.
Machinist and Tool Makers' No. 4 $12.50; No. 5, $7.00; No. 6, $10.00; No. 10, $21.50.
Jewelers' No. 7 ..... $4.00
Fisher & Norris Double Screw ..... 15&10%
Hollands':
Machinists' ..... 40@40&5%
Keystone ..... 65&5@70%
Lewis Tool Co ..... 20@30%
Merrill's 20%
Miller's Falls ..... 60&10%
Massey Vise Co.:
Clincher 40%
Perfect 30%
Lightning Grip 20%
Parker's:
Victor ..... 20@25%
Regulars ..... 20@25%
Vulcan's ..... 40@45%
Combination Pipe ..... 55@60%
Prentiss ..... 20@25%
Sargent's 40%
Smith & Hemenway Co.:
Machinists 40%
Jewelers 33⅓%
Snediker's X. L. 33⅓%
Stephens' 33⅓%

Saw Filers'—
Disston's D 8 Clamp and Guide, ₱ doz $30 ..... 25%
Perfection Saw Clamps, ₱ doz. $5 00
Reading 60%
Wentworth's Rubber Jaw, Nos. 1, 2 and 3 ..... 45&50%

Wood Workers'—
Massey Vise Co.:
Lightning Grip 15%
Perfect 15%
Wyman & Gordon's Quick Action, 6 in., $6.00; 9 in., $7.00; 14 in., $8.00.

Miscellaneous—
Bignall & Keeler Combination Pipe Vise ..... 60&10%
Hollands' Combination Pipe ..... 60@60&5%
Massey's Quick Action Pipe 40%
Parker's Combination Pipe:
87 Series 60%
187 Series ..... 60&5%
No. 870 ..... 40%

Wads—Price Per M.
Dis. 15%

B. E., 11 up	*.60c*
B. E., 9 and 10	*.70c*
B. E., 8	*.80c*
B. E., 7	*.80c*
P. E., 11 up	*$1.00*
P. E., 9 and 10	*1.25*
P. E., 8	*1.50*
P. E., 7	*1.50*
Ely's B. E., 11 and larger	*$1.70@1.75*
Ely's P. E., 12 to 20	*$3.00@3.25*

Ware, Hollow—
Cast Iron, Hollow—
Stove Hollow Ware:
Enameled ..... 55c&10@60%
Ground ..... 60c&10@65%
Plain or Unground ..... 65c&10@70%
Country Hollowware per 100 lbs., $2 50
White Enameled Ware:
Maslin Kettles 70%
Covered Ware:
Tinned and Turned 50%
Enameled 60%
See also *Pots Glue.*

Enameled—
Agate Nickel Steel Ware ..... 50&20
Agate Nickel Steel Ware, Specials ..... 60&15%
Iron Clad Ware ..... 70&10%
Lava, Enameled ..... 40&10%
Never Break Enameled 50%

Tea Kettles—
Galvanized Tea Kettles:

Inch	*6*	*7*	*8*	*9*
Each	*.45c*	*50c*	*55c*	*65c*

Steel Hollow Ware.
Avery Spiders & Griddles ..... 65@65&5%
Avery Kettles 60%
Porcelained ..... 50&5@50&10%
Never Break Spiders and Griddles ..... 65&5%
Never Break Kettles 60%
Solid Steel Spiders & Griddles ..... 65&5%
Solid Steel Kettles 60%

Warmers, Foot—
Pike Mfg. Co., Soapstone ..... 40@40&10%

Washboards—
Solid Zinc: ₱ doz
Crescent, family size, bent frame. $3.00
Red Star, family size, stationary protector $3.00
Double Zinc Surface:
Saginaw Globe, family size, stationary protector $2.65
Cable Cross, family size, stationary protector $2.90
Single Zinc Surface:
Naiad, familysize, open back perforated $2.40
Saginaw Globe, protector, family size, ventilated back $2.25
Brass Surface:
Brass King, Single Surface, open back $3.00
Nickel Plate Surface:
No. 1001 Nickel Plate, Single Surface $3.00
Glass Surface:
Glass King, Single Surface, open back, $3
Enamel Surface:
Enamel King, Single Surface, ventilated back $3.00

Washers—Leather, Axle—
Solid ..... 80c&10@85c&10%
Patent ..... 90@90&5%
Coil:

	⅞	*1*	*1¼*	*1¾*
	11c	*12c*	*13c*	*14c per box*

Inch.

Iron or Steel—
Size bolt ..... 5-16 ⅜ ½ ⅝ ¾
Washers $5.00 4.10 2.80 2.60 2.40
In lots less than one keg add ½c per lb., 5-lb. boxes add ½c to list.

Cast Washers—
Over ½ inch. barrel lots, per lb 13½@2c

Wedges—
Oil Finish ..... lb. 2.15@2.30c

Weights
Hitching—
Covert Mfg. Co ..... 40&2%
Covert's Saddlery Works ..... 60&10%

Sash—
Per ton, f.o.b. factory:
Eastern District $23.00
Western, Central and Southern Districts market unsettled, prices ranging from $17.50@19.00

Wheels, Well—
8-in., $1.50@1.55; 10-in., $1.65@1.70; 12-in., $2.25@2.35; 14-in., $3.40@3.50

Wire and Wire Goods—
Bright and Annealed:
6 to 9 ..... 80c&5@80c&7½%
10 to 18 ..... 80@80c&5%
19 to 26 ..... 80c&10@80c&10c&7½%
27 to 36 ..... 80c&5@80c&10%
Galvanized:
6 to 9 ..... 77½@77½c&5%
10 to 14 ..... 77½@77½c&5%
15 to 16 ..... 75c&7½@75c&10c&2½%
19 to 26 ..... 75c&5@75c&10%
27 to 36 ..... 72½c&5@72c&7½%
Coppered:
6 to 9 ..... 77½@77½c&5%
10 to 14 ..... 77½@77½c&7½%
15 to 18 ..... 75c&10@75c&10c&2½%
19 to 26 ..... 75c&10c&5@80%
27 to 36 ..... 75@75c&5%
Tinned:
6 to 14 ..... 77½@77½c&7½%
15 to 18 ..... 75c&5@75c&10%
Annealed, Steel and Tinned, on Spools ..... 75c&10@75c&10c&5%
Brass & Copper on Spools ..... 60c&5@60c&10c&5%
Brass, list Feb. 26, '96 ..... 30%
Copper, list Feb. 26, '96 ..... 15%
Cast Steel Wire 50%
Wire Clothes Line, see *Lines.*
Wire Picture Cord, see *Cord.*

Bright Wire Goods—
List June 24, 1903 ..... 90c&10c&10c&10@..%

Wire Cloth and Netting—
Galvanized Wire Netting ..... 80c&10@80c&10c&5%
Painted Screen Cloth, per 100 ft. $1.25
Standard Galv. Hardware Grade:
Nos. 2, 2½ and 3 Mesh, sq. ft 3c
Nos. 4 and 5 Mesh, sq. ft 3½c
No. 6 Mesh, sq ft 3½c
No. 8 Mesh, sq ft 4c

Wire Barb—See *Trade Report.*

Wrenches—
Agricultural ..... 75c&10@75c&10c&10%
Alligator or Crocodile ..... 70c&10@75%
Baxter Pat'rn S Wrenches ..... 70c&5@70c&10%
Drop Forged S ..... 45@45c&5%
Acme ..... 60c&10%
Alligator Pattern 70%
Bull Dog 70%
Bemis & Call's:
Adjustable S 40%
Adjustable S Pipe 40%
Bemis Pipe 60%
Brigg's Pattern 40%
Combination Black ..... 40&5%
Combination Bright 40%
Merrick's Pattern 50%
Boardman's 33⅓%
Coes' Genuine Knife Hdl. ..... 40&10&5&5%
Coes' Genuine Steel Hdl. ..... 40&10&5&5%
Coes' Genuine Key Model ..... 40&10&5&5%
Coes' "Mechanics' ..... 40&10&10&5&5%
Donohue's Engineer ..... 40&10%
Eagle ..... 50&10%
Elgin Wrenches 40%
Elgin Monkey Wrench Pipe Jaws 33⅓%
Gem Pocket 30%
Hercules 70%
W. & B. Machinist:
Case lots ..... 50&5%
Less than case lots 50%
Improved Pipe (W. & B.) 60%
Solid Handles, P. S. & W ..... 50@50&5%
Stillson 65%
Vulcan Chain 50%

Wrought Goods—
Staples, Hooks, &c., list March 17 '92 ..... 90@90c&10%

Yokes Neck—
Covert Saddlery Works, Trimmed 70%
Covert Saddlery Works' Neck Yoke Centers 70%

Yokes, Ox, and Ox Bows—
Fort Madison's Farmers & Freighters' .. list net

Zinc—
Sheet ..... per 100 lbs. $6.55@6.80

PAINTS, OILS AND COLORS.

White Lead, Zinc, &c.
Lead, English white, in Oil ..... 9½@ 9¼
Lead, American White, in Oil:
Lots of 500 ℔ or over ..... @ 6¼
Lots less than 500 ℔ ..... @ 7
In Barrels ..... @ 6
Lead, White, in oil, 25 ℔ tin pails, add to keg price ..... @ ½
Lead, White, in oil, 12½ ℔ tin pails, add to keg price ..... @ 1
Lead, White, in oil, 1 to 5 ℔ assorted tins, add to keg price ..... @ 1¼
Lead, American, Terms: For lots 12 tons and over ¼¢ rebate; and 2% for cash if paid in 15 days from date of invoice; for lots of 500 lbs. and over 2% for cash if paid in 15 days from date of invoice; for lots of less than 500 lbs. net.
Lead White, Dry in bbls ..... @ 6
Zinc, American, dry ..... ₱ ℔ 4½@ 4¾
Zinc, French:
Paris, Red Seal, dry 7¼
Paris, Green Seal, dry 9½
Antwerp Red Seal, dry 6½
Antwerp, Green Seal, dry 8¼
Zinc, V. M. French, in Poppy Oil, Green Seal:
Lots of 1 ton and over ..... 11¼@11¾
Lots of less than 1 ton ..... 11¼@12
Zinc, V. M French, in Poppy Oil, Red Seal:
Lots of 1 ton and over ..... 10 @10½
Lots of less than 1 ton ..... 10½@10¾
Discounts.—French Zinc.—Discounts to buyers of 10 bbl. lots of one or mixed grades, 1%; 25 bbls., 2%; 50 bbls., 4%.

Dry Colors.
Black, Carbon ..... ₱ ℔ 5 @10
Black, Drop, Amer ..... 4 @ 6
Black, Drop, Eng ..... 5 @15
Black, Ivory ..... 16 @20
Lamp, Com ..... 4½@ 6
Blue, Celestial ..... ₱ ℔ 4 @ 6
Blue, Chinese ..... 29 @ 32
Blue, Prussian ..... 27 @30
Blue, Ultramarine ..... 4½@15
Brown, Spanish ..... ½@ 1
Carmine, No. 40 ..... ₱ ℔ $3.60@4.00
Green, Chrome, ordinary ..... 3½@ 6.
Green, Chrome, pure ..... 14 @25
Lead, Red, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over ..... @ 6¼
Lots less than 500 ℔ ..... @ 7
Litharge, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over ..... @ 6¼
Lots less than 500 ℔ ..... @ 7
Ocher, American ..... ₱ ton $8.50@16.00
Orcher, American Golden ..... 2½ @ 3½
Orcher, French ..... 1¾ @ 2¾
Orcher, Foreign Golden ..... 2½@ 3½
Orange Mineral, English ..... ₱ ℔ 8½@10½
Orange Mineral, French ..... 10½@11¾
Orange Mineral, German ..... 9 @10
Orange Mineral, American ..... 8 @ 8½
Red, Indian, English ..... 4½@ 8½
Red, Indian, American ..... 3 @ 3½
Red, Turkey, English ..... 4 @10
Red, Tuscan, English ..... 7 @10
Red, Venetian, Amer. ..... ₱ 100 ℔ .80.50@1.25
Red Venetian, English ..... ₱ 100 ℔ .1.15@1 75
Sienna, Italian, Burnt and Powdered ..... ₱ ℔ 8 @ 9½
Sienna, Ital., Raw, Powd ..... 3 @ 6½
Sienna, American, Raw ..... 1½@ 2
Sienna, American, Burnt and Powdered ..... ₱ ℔ 1½@ 2
Talc, French ..... ₱ ℔ 1 @ 1½
Talc, American ..... 75 @1.25
Terra Alba, French, ₱ 100 ℔ .90 @1.00
Terra Alba, English ..... .90 @1.00
Terra Alba, American No. 1 ..... .60 @70
Terra Alba, American No. 2 ..... .45 @50
Umber, Turkey, Bnt. & Pow. ₱ ℔ 2½@ 3½
Umber, Turkey, Raw & Powd. 2½@ 3½
Umber, Bnt. Amer ..... 1½@ 2
Umber, Raw, Amer ..... 1½@ 2
Yellow, Chrome ..... 11 @14
Vermilion, American Lead ..... 10 @25
Vermilion, Quicksilver, bulk ..... @65
Vermilion, Quicksilver, bags ..... @66
Vermilion, English, Import ..... .75 @80
Vermilion, Chinese ..... .90.90@1.00

Colors in Oil.
Black, Lampblack ..... 12 @14
Blue, Chinese ..... 36 @46
Blue, Prussian ..... 32 @36
Blue, Ultramarine ..... 13 @16
Brown, Vandyke ..... 11 @14
Green, Chrome ..... 10 @15
Green, Paris ..... @24
Sienna, Raw ..... 12 @15
Sienna, Burnt ..... 12 @15
Umber, Raw ..... 11 @14
Umber, Burnt ..... 11 @14

Miscellaneous.
Barytes, White Foreign, ₱ ton $17.50@20.00
Barytes Amer. floated ..... 16.00@17.00
Barytes, Crude, No. 1 ..... 10.00@11.00
Chalk, in bulk ..... ₱ ton 3.00@ 3.25
Chalk, in bbls ..... ₱ 100 ℔ .@ 35
China Clay, English ..... ₱ ton 12.00@17.00
Cobalt, Oxide ..... ₱ 100 ℔ 2.50@ ...
Whiting, Common ..... ₱ 100 ℔ .45@ .48
Whiting, Gliders ..... .55@ .57
Whiting, extra Gliders' ..... .58@ .60

Putty.
In bladders ..... 1¼@2
In bulk ..... 1 @1¼
In cans 1 ℔ to 5 ℔ ..... 2½@4
In cans 12½ ℔ to 25 ℔ ..... 1¾@2

Spirits Turpentine.
In Oil bbls ..... 55 @55½
In machine bbls ..... 55½@56

Glue.
Cabinet ..... ₱ ℔ 11 @15
Common Bone ..... 6 @ 8
Extra White ..... 18 @24
Foot Stock, White ..... 11 @14
Foot Stock, Brown ..... 7 @10
German Hides ..... 12 @18
French ..... 10 @40
Irish ..... 13 @16
Low Grade ..... 8 @11
Medium White ..... 14 @17

Cum Shellac— Cts. per lb.
Bleached, Commercial ..... 41 @..
Bone Dried ..... 52 @..
Button ..... 45 @60
Diamond I ..... 59 @..
Fine Orange ..... 52 @54
A. C. Garnet ..... 46 @..
D. C ..... 1.00 @..
Octagon B ..... 54 @55
T. N ..... 48 @49
V. S. O ..... 60 @..

Animal, Fish and Vegetable Oils.
Linseed, City, raw ..... ₱ gal. 41 @42
Linseed, City, boiled ..... 43 @44
Linseed, State and West'n, raw 38 @39
Linseed, raw Calcutta seed ..... @65
Lard, Prime, Winter ..... 60 @61
Lard, Extra No. 1 ..... 48 @49
Lard, No. 2 ..... 36 @38
Cotton-seed, Crude, f.o.b mills. 19½@20
Cotton-seed, Summer Yellow, prime ..... 23 @23½
Cotton-seed Summer Yellow, off grades ..... 27½@28
Sperm, Crude ..... 50 @..
Sperm, Natural Spring ..... 53 @55
Sperm, Bleached Spring ..... 57 @58
Sperm, Natural Winter ..... 55 @56
Sperm, Bleached Winter ..... 58 @59
Tallow, Prime ..... 49 @50
Whale, Crude ..... @..
Whale, Natural Winter ..... 43 @44
Whale Bleached Winter ..... 45 @46
Menhaden, Brown, Strained ..... 27 @28
Menhaden, Light Strained ..... 34 @29
Menhaden, Bleached Winter ..... 0 @32
Menhaden, Ex Bleached Winter 32 @33
Menhaden, Southern ..... 20 @21
Cocoanut, Ceylon ..... 7¼@ 7½
Cocoanut, Cochin ..... 7¾@ 7½
Cod, Domestic ..... 34 @44
Cod, Newfoundland ..... 37½@38
Red Elaine ..... 28 @30
Red Saponified ..... ₱ ℔ 4¼@ 4½
Olive, Italian, bbls ..... 51 @56
Neatsfoot prime ..... 50 @51
Palm, prime, Lagos ..... ₱ ℔ 5¾@ 6¼

Mineral Oils.
Black, 30 gravity, 25@30 cold test ..... ₱ gal. 11 @12
Black, 30 gravity, 15 cold test. 12 @13
Black, Summer ..... 11 @12
Cylinder, light filtered ..... 18½@19½
Cylinder, dark filtered ..... 16½@17½
Paraffine, 903-907 gravity ..... 13 @13½
Paraffine, 903 gravity ..... 12 @13½
Paraffine, 883 gravity ..... 9¼@10
Paraffine, red ..... 12 @13½
In small lots ½¢ advance.

For the Table of "Current Metal Prices" see the First Issue of Every Month.